

2007

Albert B. Sabin
Gold Medal

Address Delivered by
Award Recipient

Hilary Koprowski, MD

Salute by Stanley B. Prusiner, MD
and Stanley A. Plotkin, MD, PhD

May 1, 2007
Baltimore, Maryland

WELCOME

Peter J. Hotez, MD, PhD

President and CEO, Sabin Vaccine Institute

The Albert B. Sabin Gold Medal is awarded annually by the Sabin Vaccine Institute to recognize individuals who personify exemplary contributions to disease prevention through development or use of vaccines. Nominations are solicited from members of the scientific community, and from these noteworthy nominees, an honoree is selected by the Sabin Gold Medal Advisory Committee, composed of previous medal recipients and chaired by Maj. Gen. Philip K. Russell, MD (USA Ret.).

The 2007 winner of the Sabin Gold Medal is Hilary Koprowski, MD, one of the world's outstanding biomedical researchers over the last half century. A contemporary of Albert Sabin and Jonas Salk, Dr. Koprowski was actually the first to test a polio vaccine in large-scale human trials, and his work on a live-virus vaccine laid the foundation for Dr. Sabin's oral polio vaccine, which became the preferred instrument in the worldwide campaign to eradicate polio.

Even beyond this early work, the scope of Dr. Koprowski's achievements is simply remarkable, ranging from polio to rabies and to monoclonal antibodies that are a key to effective cancer immunotherapy. Any serious discussion of the giants of 20th century biomedical research must include Hilary Koprowski as one of the most prominent.

For his many accomplishments that have had an impact on so many people's lives, Dr. Koprowski was invited to join the list of previous Sabin Gold Medal recipients, which includes some of the foremost contributors to the modern era of public health.

Reproduced in this booklet is a tribute to Dr. Koprowski made by Stanley Prusiner, MD, and Stanley Plotkin, MD, as well as Dr. Koprowski's personal reflections, and some amusing illustrations created by Manuel Covarrubias, a talented member of Dr. Koprowski's laboratory team.

From the time of its creation in 1994, the Sabin Gold Medal and this awards ceremony gained immediate international recognition. We would not be able to do it, however, without the support of our sponsors, to whom I want to express our deepest thanks. This year they are GlaxoSmithKline, MedImmune, Sanofi Pasteur, and Wyeth. These corporations have been loyal partners and supporters of our Institute for many years, and deserve our heartfelt thanks.



I hope you will be appropriately entertained and informed by this booklet, which is offered as a commemorative of the 2007 Sabin Gold Medal event.

Peter J. Hotez, MD, PhD

HILARY KOPROWSKI, MD
2007 ALBERT B. SABIN GOLD MEDAL RECIPIENT

Born in Warsaw, Poland, Dr. Hilary Koprowski was interested in both music and science, and has excelled in both arenas. He initially received a degree in piano from the Warsaw Conservatory, and then an MD degree in 1939 from the University of Warsaw. Dr. Koprowski then began to dedicate himself to conducting scientific research, although he continued to study music. He graduated from the Santa Cecilia Academy in Rome in 1940, and then went to Brazil. Soon he moved to the United States where he eventually became the Director of The Wistar Institute in 1957. There he revived a venerable, but decaying institution and made it a leading research center for the investigation of cancer and viral diseases. He also recruited top biologists from literally all parts of the world.



Dr. Koprowski is one of the outstanding scientists of our time. His research is responsible for a variety of remarkable clinical advances in human and animal immunology and virology during his 50-year scientific career. Among Dr. Koprowski's most notable achievements have been the development of a live oral poliomyelitis vaccine, which was the first such vaccine to be used in mass trials. Dr. Koprowski, along with his co-workers, also engineered a more effective and less painful rabies vaccine than the traditional Pasteur technique. In addition, Dr. Koprowski has been a pioneer in the development of monoclonal antibodies (mAbs), which are used to detect cancer antigens and in cancer immunotherapy.

Dr. Koprowski is the author of more than 850 scientific papers and is a member of many prestigious societies. He has also received honorary degrees from numerous universities, and is the recipient of many honors, including the Philadelphia Award, the Scott Award, and the French Legion of Honor. Dr. Koprowski is also a member of the National Academy of Sciences and the American Academy of Arts and Sciences. Currently, he is the Director of the Institute of Biotechnology and Advanced Molecular Medicine, as well as the Center for Neurovirology at Thomas Jefferson University. In addition to his scientific and musical interests, including a serious devotion to musical composition, Hilary Koprowski is a linguist and a student of world literature who appreciates such diverse writers as Arthur Rimbaud, Ezra Pound, Marcel Proust, John Ford, Pietro Arentino, and H.L. Mencken.

HONOREE SALUTE

Stanley B. Prusiner, MD
and Stanley A. Plotkin, MD

This is a grand occasion—the award of the Albert B. Sabin Gold Medal to Hilary Koprowski. Hilary is a giant in the field of vaccinology, and it is most fitting to bestow this honor on him.

Hilary is very special to all of us, and we applaud and honor him. He is an extraordinary human being, and we love him. Hilary Koprowski's life is a celebration of humanity, dignity, and achievement in the sciences, languages, literature, arts and music. Hilary represents the pinnacle to which we all aspire.

In summarizing Hilary's journeys and his accomplishments, I have chosen to borrow from Stanley Plotkin's beautiful tribute to Hilary on the occasion of Hilary's 90th birthday celebration last December in Philadelphia:

“Beginning his life-long interest in music, Hilary graduated in Piano from the Warsaw Conservatory. In 1939, he was forced to leave Poland and went to Italy where he continued his musical studies at the Conservatorio Di Musica St. Cecilia in Rome. Once again, he was forced to move—this time emigrating to Brazil where he joined the Yellow Fever Laboratory of the Rockefeller Institute and began his work in Virology. In 1944, the opportunity arose to come to the United States to work in Lederle Labs. There, he began his studies on rabies and polio.

—It is not an exaggeration to say that *no one* since Louis Pasteur has done more to advance the prevention of rabies than Hilary. At successive institutions—Lederle, Wistar, and Jefferson, he developed attenuated vaccines for humans and animals, inactivated cell culture vaccines for humans, an antibody for passive immunization, a vector vaccine to immunize wild animals through the use of baits, and rabies antigens in transgenic plants. Any one of these advances would have been monumental—that one man should have been responsible for *all* is incredible! Thousands of people owe their lives to Hilary.

—Of course, the accomplishments in rabies are only rivaled by his accomplishments in polio research. As early as the late 1940's, Hilary was working on the attenuation of polio virus, at a time when relatively little was known about the virus, let alone its attenuation. Despite a history of dangerous mistakes by others, Hilary proceeded to adapt a type 2 polio strain to mouse brain, which resulted in an attenuated virus that he fed first to himself and then to susceptible children in 1950. Subsequently, other strains were developed in his laboratory and tested in humans. In 1957, those strains were given by mass immunization to inhabitants of the then Belgian Congo, where polio was endemic. This development of an oral polio vaccine prefigured the work of Albert Sabin, and has ultimately led to the near eradication of polio from the world.



Hilary Koprowski and Stanley B. Prusiner

—The largest part of Hilary's career has been spent at The Wistar Institute where for 35 years he was Director. I can attest to the fact that somehow Hilary was able to continue his own work while running a tight

ship and yet allowing each Wistar scientist to develop and express his or her creativity. During that tenure and since 1992 at Jefferson Medical College, he has produced ground-breaking work in multiple fields, of which I have time only to list the following: monoclonal antibodies against infectious agents and cancers; anti-idiotypic antibodies; etiology and treatment of multiple sclerosis; viruses transmitted by insects; slow viruses; SV40 virus; subacute sclerosing panencephalitis; viruses causing cancer; and even SARS virus. All of this has been accomplished together with a semi-professional musical career and a profound interest in art and literature.

—Of course, his career has been recognized by multiple awards. In this case, the cliché that there are too many to mention is true. Among them are awards from the governments of Poland, Finland, France, and Belgium, as well as awards from the City of Philadelphia, and membership in the National Academy of Sciences. This phenomenon called “Hilary Koprowski” has now reached the grand old age of 90 with grace and without losing the enthusiasm of youth. I am reminded of a phrase by Victor Hugo, ‘One sees flames in the eyes of the young, but in the eyes of the old one sees light.’ ”

Dr. Plotkin’s magnificent tribute to Hilary captures the extraordinary list of remarkable accomplishments that punctuate Hilary’s life. Hilary looked ahead to big problems, and he wanted to solve them. He pursued a big problem for nearly two decades until he, Albert Sabin and Jonas Salk nearly eradicated polio from our planet.

The award of the Sabin Gold Medal to Hilary Koprowski is the recognition of a renaissance man who devoted so much of his life to improving the lives of people all over our planet. Hilary’s seminal contributions to the field of vaccine development will be remembered for many score years to come.

I am sure that if Albert Sabin were alive, he would be delighted that a Gold Medal named in his honor was presented to Hilary Koprowski. And Sabin would be pleased that Hilary was so happy to be the recipient of this very special honor.



From left to right: Peter J. Hotez, Hilary Koprowski, Stanley B. Prusiner

REMARKS UPON ACCEPTANCE OF THE SABIN GOLD MEDAL PRESENTATION

by Hilary Koprowski, MD

Before my lecture, I first want to thank the Albert B. Sabin Vaccine Institute for the honor of being presented this evening with the Sabin Gold Medal. It was a winter night in 1946 when I was driving from New York City to my temporary home in Pearl River, New York, after a meeting with Max Theiler, a Swiss scientist from South Africa. Theiler, together with a Canadian, Dr. Wray Lloyd, was the first to describe a live attenuated virus vaccine (against yellow fever). Theiler took the virulent yellow fever virus and injected it into developing chick embryos. After verifying that the virus multiplied in its host, he serially passaged the virus in chick embryos and identified a point at which the virus became avirulent and attenuated in animals for which it was normally lethal. Shortly thereafter, Theiler produced the first man-made attenuated virus vaccine. I was working for the Rockefeller Foundation in Brazil at that time and was acquainted with the vaccination program there involving the Theiler-Lloyd vaccine against yellow fever. I also witnessed the first incidence of yellow fever sickness among some of the vaccinees, who fortunately did not die. Lloyd, who was then in Brazil, investigated this problem and found that the vaccines originated from different seed lots representing various passage levels in chick embryos. The personnel in Rio de Janeiro were not overly perturbed by the incident and simply requested that every vaccine lot from now on be produced from the same seed lot of the virus. This was done and the vaccine was without adverse sequelae until World War II, when many vaccinated recruits developed hepatitis this time; it was the human serum used as the vaccine diluent that caused the disease. After this was corrected, the use of the vaccine was uneventful and remains so to date.

Imagine what would happen if this scenario took place today! Lloyd and Theiler would be fired from their jobs, sued, possibly jailed, and the availability of yellow fever vaccine delayed for two to three decades. But let me go on with the polio story. During my night ride, it occurred to me that the yellow fever vaccine “approach” could be used in the case of polio. The problem was finding an “unnatural host” for the polio virus, such as chick

embryo in the case of yellow fever. This was solved by Armstrong's discovery in 1938 that cotton rats are susceptible to polio infection. We decided to infect the rats of this species with type 3 polio virus isolated from a patient and to begin serial passages of the virus in rats. Virus recovered after several serial passages were injected intracerebrally into rhesus monkeys. Because careful observation of the monkeys revealed no signs of severe sickness or neurological abnormalities, the experiments were expanded to the generation of several seed lots from cotton rat brain and testing for avirulence in a larger number of monkeys.

Tom Norton, who was originally Max Theiler's technician, was persuaded by Theiler to transfer from the Rockefeller Foundation to Lederle Laboratories to work with me. We decided to test our first polio vaccine product on ourselves - not so much to establish safety of the attenuated polio virus since we both had antibodies against the virus, but rather to test the safety of the cotton rat brain suspension as a vaccine delivery vehicle. The concoction tasted somewhat like cod liver oil and proved to be harmless.

One of our collaborators was George Jervis, a neuropathologist by training who was also an administrator at Letchworth Village, a neighboring institution for "special" children. One day, he visited us at Lederle, very perturbed and fearing the spread of polio "like fire" in his institution from several polio cases reported in nearby Nyack, New York. His wards were throwing their feces at themselves and other children, and a general polio outbreak was imminent. He asked whether we would be willing to permit him to use our oral vaccine to immunize the children. If we agreed, Jervis would see to all necessary formalities to establish the date of the first effective immunization of a human subject with oral polio vaccine. The date was February 27, 1950. The child receiving this first polio vaccine in a cod liver oil-tasting concoction swallowed it without difficulty. A crowd of doctors, many neurologists, volunteered as attendees to watch this child during the next few days and nights. No untoward events associated with vaccination were observed and polio antibodies were detected in the child's blood. A decision was then made to extend the trial to 19 children in the same institution. They ingested the same lot of vaccine and became immunized against polio.

On March 15-17, 1951 in Hershey, PA, the National Foundation for Infantile Paralysis sponsored the Proceedings of the Round Table Conference on "Immunization in Poliomyelitis" in an effort to promote

the urgency of developing a protective polio vaccine. I decided to present there the results of the oral immunization of the 19 children with the live virus. The presentation was scheduled immediately after lunch. Tom Francis, who was having a light post-prandial snooze, opened one eye during my talk and turned to Salk sitting next to him, asking: “What are these monkeys on his slide?” “They are not monkeys,” replied Salk, “They are polio-vaccinated children.” Francis woke up completely and remained so for the rest of my talk. The response of the participants was mostly one of bewilderment; the exception was Jules Freund, an outstanding immunologist from New York, who said, “This is the right approach, Hilary.” Two veteran polio researchers, David Bodian and Howard A. Howe filed a comment on my presentation at the Hershey Meeting. Bodian, a prominent polio scientist, referring to this first immunization of children with polio vaccine in 1950 as a “turning point in the development of a successful vaccine...as a natural and courageous next step in the battle against polio.” Howe continued by saying, “Koprowski has shown to all of us that our experimental results of immunization of chimpanzees may be also expected in man.”

At the Hershey meeting, I met Albert Sabin for the first time, although I knew of him from his mentor, Peter Kosciuszko Olitsky, a member of the Rockefeller Institute. Olitsky befriended me after my arrival from Brazil when the Rockefeller Foundation permitted me to use their quarters at the Rockefeller Institute in order to complete the manuscripts, co-authored with Ed Lennette describing a result of my work with Lennette in Rio. At that time, microbiology research at the Rockefeller Institute and Rockefeller Foundation was of the highest quality. There, I first heard about “a



young, brash scientist who studied the factors involved in the neuroinvasiveness of viruses. Sabin certainly has a bright future,” concluded Olitsky. “Imagine,” continued Olitsky, “that during his stay here, he isolated and characterized the

herpes B virus which caused the death of scientists bitten by virus-carrying monkeys.”

At the Hershey meeting, Sabin gave a talk entitled “Maternal transfer of passive immunity.” He



also approached me after my talk and asked, “Why did you do it?” He was very guarded in his comments to me but, in general, was rather skeptical. I stood my ground, telling him that “someone had to take the next step, so it might as well be me!” I probably convinced him as future events showed. During the next few decades we had many encounters, some of which ended in an amicable and peaceful exchange of interests and materials.

The results of the first trial with live virus oral polio vaccine were made public (without my knowledge or expectation). In January of 1952, we published a paper in the American Journal of Hygiene on the first human trial with the oral polio vaccine. I did not attend the 1952 meeting of the Federation of American Society of Experimental Biology in New York, but journalists apparently besieged the known polio researchers such as Howe and Bodian with the question, “When shall we finally have a polio vaccine?” “But we have one,” David Bodian told them! Its existence was revealed in a publication in the American Journal of Hygiene in January of that year.

I was in my home in Englewood, New Jersey, when suddenly a series of telephone calls demanded “news” about the “new polio vaccine”. The journalist Earl Ubell of the now-defunct New York Herald Tribune said, “I am driving to your home to get the first-hand account about the vaccine.” His article appeared on page-one of the Tribune the next day (April 16, 1952).

In the next decade, we increased the number of children vaccinated in the United States with our vaccine, so that by 1960, more than 1000 subjects were vaccinated in the United States and a much larger number in what was then Belgian Congo. Vaccination of 250,000 children in five weeks in the Belgian Congo was the first major immunization trial with a vaccine. The Belgian Colonial Government of the Province Oriental in the Congo, requested Ghilain Courtois, head of their main laboratory in the then Stanleyville area, to vaccinate populations of children in the Ruzizi Valley of Eastern Congo. At that time, Courtois was collaborating with me in a study on a variety of several immunization procedures to vaccinate chimpanzees at a colony which he established in Stanleyville. He insisted on the immunization of the camp personnel before we turned shortly to the large-scale immunization trial in the Ruzizi Valley.

To break the tedium of my litany, I will relate some comical episodes in the polio vaccination saga. We vaccinated infants with oral polio vaccine in the only prison for women in the state of New Jersey (Clinton Farms). This was a model prison run by the great prison reformer, Ms. Mahan. There were no bars and no guards at this prison - and nothing to prevent a young prisoner from flagging down a truck and climbing in the cab on Route 23 in front of the prison within one mile of the prison, and ending up being pregnant – and ultimately returning to the prison. (Since I want to keep this talk “G” rated – and not “X” rated – I avoided making a slide of that event.) Ms. Mahan deathly feared a polio outbreak in her prison among newborns and asked Drs. Stokes, Plotkin and myself to vaccinate the infant population with our vaccine. Ms. Mahan used to invite our group to her home for an evening meal after a day of vaccination. At the meal, Dr. Stokes, the Director of the Children’s Hospital in Philadelphia, congratulated Ms. Mahan for the excellence of her cook’s skills and asked about the crime the cook had committed that resulted in her imprisonment. Ms. Mahan answered, “She poisoned her husband.” At that moment, Stokes found it difficult to swallow the food he had just placed in his mouth.

The second episode of a comical nature happened at an international polio meeting in which the Russians reported on a mass vaccination trial (9 million individuals) with Sabin strains of vaccine. A conference participant asked the Russian researcher whether any side effects were observed following vaccination. “None” was the answer. “Nobody had a headache among the more

than 9 million vaccinated?” “Nobody,” was the answer. “Then I don’t believe anything you said,” replied the inquiring participant - and then the curtain fell.

In the face of raging polio epidemics, the Director of the State Institute of Hygiene in Poland requested my vaccine to stop the epidemic. Quick calculation indicated that Poland would need a vaccine supply sufficient for 9 million children. Wyeth agreed to produce the vaccine, Moore McCormick Steamship Line provided free transport on their boat to Poland, and my colleague, the late Art Stern, accompanied the shipment to help organize the mass vaccine immunization trial. This took place in 1960-61 and the incidence of paralytic polio dropped from 770 cases to a few cases.

The first decade after the discovery of a polio vaccine is sometimes referred to as a period of “polio wars.” The principal protagonists were Albert Sabin and Jonas Salk. My participation was minimal except that I always supported the concept of live oral virus vaccine vs. formalin-inactivated virus vaccine.

Obviously, Sabin and I met at various meetings and conferences during the years following the “polio wars.” I still vividly recall our encounter in Poland. I suspect it was rather a special occasion for Albert to visit for the first time, since it was the country of his birth and his life in early years. The Polish authorities also made it possible for him to visit Bialystok, his birthplace. I sensed that Albert enjoyed his first return to Poland.

The second memorable encounter between Sabin and me was more interesting. The Soviet Union was celebrating its 20th anniversary of the end of World War II. Sabin and I were both in the Soviet Union then and were singled out as honored guests of a victory parade. I left my hotel to get a taxi to take me to Red Square, only to learn that taxis were not permitted to Red Square



and that I would have to take the Metro. I knew that I would be late for the parade but nonetheless traveled by Metro to the station near Red Square. The parade had already begun. I saw a be-medaled gentleman, presumably a general, walking in the direction of the



parade. I accosted him, saying that I was a foreigner invited to the parade but knowing that I was late and would he please help me. He kindly saluted and we both marched to the visitors' box. Sabin was already there and was being attended by another general. My own general made great efforts to note the similarity between this parade and the one held in the time of the czar. Apparently, Albert was told the same by his dotting general. When Marshall Malinowski gave his speech, which included a strong attack on the United States, the two generals discreetly disappeared for a few minutes and did not return until after the speech. When the parade finished, I walked with Albert back to the Metro station and he asked me "Are your thoughts the same as mine?" I said "Yes. It would be difficult for us to fit in this country!" For once, we both agreed.

Contact with Sabin became less frequent when he became so busy and with so many public demands, mostly by countries where vaccinators sought his help in arranging mass distribution of the vaccine, etc. When this period of "public" engagement subsided, we communicated more frequently. This was again interrupted by Sabin's sojourn to Israel. After he terminated this adventure, Albert's interests were quite taken up by AIDS and the research developed in this field. I last saw Albert at the Annual AIDS Meeting held by Dr. Robert Gallo in Baltimore.

Speaking of AIDS, I should mention in passing that the English journalist Edward Hooper used the Congo polio trial to falsify and fabricate the origin of AIDS as published in the book "The River."

These fabrications were repudiated at the meeting of the Royal Society in London. Hooper also contributed to the creation of a film entitled “The Origin of AIDS,” which is also based on sheer fabrication. Hooper produced this film with French Television. Sabin’s reaction to Hooper’s fantasies was that this is “a most irresponsible and uncritical communication.”

I was asked by the editors of NATURE to write an obituary of Albert. I will repeat to you what I wrote then.

“At one time, Sabin and I became adversaries over the selection of polio virus strains to be used as oral vaccines. This did not affect our long-lasting friendship and mutual respect. Courageous and wise. This is how I see him; I will miss him sorely”. And that ends my talk.

I would like to name a few people to whom I would like to express my sincere thanks.

- (1) DR. STANLEY PLOTKIN: My oldest friend and collaborator;
- (2) DR. STANLEY PRUSINER: A dear friend who is probably tired from attending recent meetings to present me to different audiences;
- (3) DR. MICHAEL KATZ: Another great friend and supporter.
- (4) MANUEL COVARRUBIAS for the excellent drawings which I used in this talk.
- (5) LAST, BUT NOT LEAST, I WOULD LIKE TO GIVE PARTICULAR THANKS TO MY WIFE, DR. IRENA KOPROWSKA, AND MY SONS, DR. CLAUDE KOPROWSKI AND DR. CHRISTOPHER KOPROWSKI, WHO HAVE ALL LIVED THROUGH THIS HISTORY WITH ME.

THANK YOU.



Peter J. Hotez and Hilary Koprowski

THE ALBERT B. SABIN GOLD MEDAL

The Albert B. Sabin Vaccine Institute annually recognizes and honors those who have made extraordinary contributions to the field of vaccinology by awarding The Albert B. Sabin Gold Medal.

PAST HONOREES

1994~Donald A. Henderson, MD, MPH · 1995~Robert M. Chanock, MD
1996~Joseph L. Melnick, PhD (*d. 2001*) · 1997~Maurice R. Hilleman, PhD, DSc (*d. 2005*)



1994



1995



1996



1997

1998~Myron M. Levine, MD, DTPH · 1998~Allen C. Steere, MD
1999~Maj. Gen. Philip K. Russell, MD (USA Ret.) · 2000~Ciro A. de Quadros, MD, MPH
2001~John B. Robbins, MD



1998



1998



1999



2000



2001

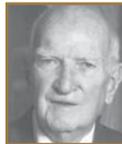
2002~Stanley A. Plotkin, MD · 2003~Samuel L. Katz, MD
2004~William S. Jordan, Jr., MD · 2005~Albert Z. Kapikian, MD
· 2006~William H. Foegle, MD, MPH



2002



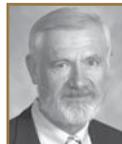
2003



2004



2005



2006



SABIN VACCINE INSTITUTE

The twofold mission of the Sabin Vaccine Institute (SVI) is to realize the enormous potential of vaccines to control and eradicate disease by developing new vaccines and better delivery systems, and to promote increased use of currently available vaccines. The vision of SVI is to save lives by stimulating development of new vaccines and increasing immunization rates globally. The Institute promotes cutting-edge vaccine research and innovations, identifies new research opportunities, advocates sound public policy toward vaccines and immunization, and educates the public and media about the benefits of vaccines. Founded in 1993, SVI builds bridges between leaders in science, academia, industry, and government to create solutions to worldwide health threats. In pursuing the legacy of renowned vaccinologist and statesman Dr. Albert B. Sabin, the Institute facilitates the exchange of ideas for solutions to emerging and ancient diseases, from hookworm to cancer. By helping to unlock the vast potential of vaccines, SVI is working to ensure that the diseases that threaten the world today will be only history lessons for future generations.

Sabin Vaccine Institute works to advance human development by ensuring that underserved communities worldwide have access to essential medicines and vaccines that reduce or eliminate the impact of the diseases of poverty.

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