

Progress in Polio Eradication: Vaccine Strategies for the End Game

Editor: F. Brown

This volume of *Developments in Biologicals*, devoted as it is to progress towards the eradication of poliomyelitis and associated vaccination issues, covers a topic which is of major international public health importance and reflects one of the great successes of modern medicine. The volume reports scientific presentations and discussions on a wide range of aspects of polio eradication and vaccination at an international symposium held under the auspices of the International Association for Biologicals at the Pasteur Institute, Paris on 28th-30th June 2000. Highlights of the meeting include documentation of the highly impressive progress towards global eradication and the role of the WHO Polio Eradication Programme. The numbers of polio cases were reported to have declined from 350,000 cases in 125 countries in 1988 at the start of the Programme, to 2,880 cases in 20 countries in 2000, a 99% reduction.

The papers presented in the volume include those on the efficiency and reliability of virological surveillance and the scientific basis for certification of eradication and include perspectives from countries in the developing world as well as from the developed.

Speakers provided updates on the molecular biology and genetics of poliovirus and poliovaccines, including the molecular basis for attenuation and reversion to virulence and the interesting area of receptor specificity for polio and other enteroviruses. The advantages and disadvantages of current poliovaccines and immunization strategies are reviewed by participants from industry and public health organizations. A critically important issue, addressed particularly in Round Table discussions, was the role of inactivated poliovaccines in the end-game and the vexed question of when and how can vaccination against polio be safely suspended as well as the risks of re-introduction of polio post-eradication and post-vaccination.

Much attention was given to gaps in our scientific knowledge in the fields of virology, immunology and epidemiology relevant to the end-game of polio eradication and priorities for future scientific research.

Subsequently to the symposium events in the Dominican Republic concerning the circulation of vaccine derived strains of poliotype 1 which exhibited considerable genetic evolution from vaccine virus were reported (MMWR 50(39): 855-856, 2001). These are the first polio cases to occur in the Americas since 1991. This occurrence reinforces the views of the symposium participants of the need for intensive surveillance and the continuation of research.

This volume will remain a key reference on polio eradication and vaccination for many years to come. Its value is enriched by the involvement of colleagues from a wide range of backgrounds, including public health organization, academic researchers, vaccine manufacturers and managers of immunization programmes.

PROFESSOR FLORIAN HORAUD (1925-2000)

An Appreciation

Professor Florian Horaud, to whose memory this special volume of *Developments in Biologicals* is dedicated, passed away on 28 July 2000, in Paris at the age of 75. He had been fully active professionally and scientifically right up to the end of his life and was a wonderful friend and colleague of the many who were privileged to know and work with him.

Florian was a virologist par excellence who spent much of his career working on poliovirus and polio vaccine, both in his native Romania and at the Institut Pasteur in Paris. He had an enquiring mind and made an important contribution to polio research. His scientific memory was legendary and his knowledge of the history of vaccines and vaccination was second to none. His long career had brought him in touch with the great and he had been a friend and confidant of both Jonas Salk and Albert Sabin and many other famous figures of virology and medical science.

From 1992-2000 Florian served with great distinction as President of the International Association for Biological Standardization and took a great personal interest in the Symposia it organized. He worked tirelessly for the success of the Association. As President of the IABs, he was a great advocate for scientific research underpinning the quality, safety and standardization of biologicals.

Florian was born in Romania and graduated in medicine in 1951. He worked for several years (1953-1971) on poliovaccine development at the Cantacuzino Institute in Bucharest. In 1971 an opportunity arose to take up a Research Fellowship at the Institut Pasteur in Paris. There his talents were quickly recognised

and shortly afterwards he was appointed Chief of the Laboratory of Medical Virology and eventually to a full Professorship and Headship of the Department of Virology. His work on poliovirus continued to flourish at the Pasteur and he was a major contributor to the work of a group at Pasteur who made important contributions to poliovirus research combining biological studies with modern molecular approaches.

Florian's long and wide experience of vaccines and vaccination and public health issues made him a most valuable participant in any forum on vaccines and other biologicals and their regulation. His advice was much sought after internationally. He was a frequent and active participant in many WHO committees. I well recall his important contributions to the work of the WHO Steering Committee on Poliovaccines in the 1980s. He was also a very prominent and active member of the Biotechnology Working Party - a scientific working party advising the Committee on Proprietary Medicinal Products of the EU - and took an active role from 1986 onwards in the drafting of the key European guidelines in relation to the production, quality control and standardization for biological and biotechnology products, a field in which his long and wide experience and scientific understanding were of great value. He remained an active and effective member of the Biotechnology Working Party right up to his death. In France he made a major contribution to the safety of biologicals. He was a special adviser to the Agence Française de Sécurité Sanitaire des Produits and the Chairman of its Advisory Committee on Viral Safety from 1993-2000. It should not be assumed that Florian was a 'yes' man in committee. He was indeed a vigorous, highly articulate defender of his views which almost always were strongly based on science, practical experience and common sense.

Florian had a successful entrepreneurial bent to his character. He was much involved in establishing a Biotechnology Service Unit (Texcell) at the Institut Pasteur and was its Scientific Director from 1987-1993.

One of Florian's last achievements was the organization of the Symposium on Progress in Polio Eradication; its great success reflected his wisdom and eminence in the field. This volume will be a fitting and lasting tribute to Florian and his work and I am sure it will remain a standard reference work on polio and poliovaccines for many years to come.

Florian was a scientist of great personal charm and generosity of spirit. He had an extraordinarily infectious enthusiasm for science and international co-operation. He will be much missed by all his very many colleagues and friends around the world. Florian is survived by his wife Thea, an eminent microbiologist, and their two sons.

G. C. Schild
NIBSC, Potters Bar
31 January 2001

Contents

Session I: Status of Polio Eradication

Chairperson: *Walt Orenstein*

Progress Towards Global Polio Eradication: *H.F. Hull*

Progress Towards Polio Eradication: An African Perspective: *B.D. Schoub, H.N. Gumede, T.G. Besselaar, N.K. Blackburn, E.M. Webb, O. Tomori, M. Otten*

The Efficiency and Reliability of Polio Surveillance: *T. Hovi*

A Scenario for Polio Eradication: *I. Arita*

Session II: The Biology and Molecular Biology of Polioviruses

Chairperson: *Jeff Almond*

Some Problems of Molecular Biology of Poliovirus Infection Relevant to Pathogenesis, Viral Spread and Evolution: *V.I. Agol, G.A. Belov, E.A. Cherkasova, G.V. Gavrilin, M.S. Kolesnikova, L.I. Romanova, E.A. Tolskaya*

The Molecular Basis of Poliovirus Neurovirulence: *S. Ohka, A. Nomoto*

Session III: Current Poliovirus Vaccines

Chairperson: *David Wood*

Strengths and Weaknesses of Current Polio Vaccines - A View from Industry: *F.E. André*

Session IV: When and How Can we Stop Vaccination?

Chairperson: *John Furesz*

The Scientific Basis of Stopping Polio Immunisation - Issues and Challenges: *D.J. Wood*

Session V: Risks of Reintroduction of Polio Post Eradication

Chairperson: *Tapani Hovi*

Characteristics of Poliovirus Strains from Long-Term Excretors with Primary Immunodeficiencies: *P.D. Minor*

Poster Session I

Risks of Reintroduction of Polio after Eradication: the Vaccine Origin of an Outbreak of Type 3 Poliomyelitis: *J. Martin, G.L. Ferguson, D.J. Wood, P.D. Minor*

Neurovirulence of Sabin I-Derived Polioviruses Isolated from an Immunodeficient Patient with Prolonged Viral Excretion: *T. Yoneyama, H. Yoshida, H. Shimizu, K. Yoshii, N. Nagata, O. Kew, T. Miyamura.*

Poliovirus Persistence in Human Cells *in vitro*: *F. Colbère-Garapin, S. Jacques, A.-S. Drillet, N. Pavio, T. Couderc, B. Blondel, I. Pelletier*

Rotary International: A Partner in Polio Eradication: *J.L. Sever*

Session VI: Post Eradication Issues

Chairperson: *Barry Schoub*

Will the Polio Niche Remain Vacant?: *E. Rieder, A.E. Gorbalenya, C. Xiao, Y. He, T.S. Baker, R.J. Kuhn, M.G. Rossmann, E. Wimmer*

The Eradication of Foot-and-Mouth Disease: a Parallel Problem: *F. Brown*

Stopping a Polio Outbreak in the Post-Eradication Era: *P.E.M. Fine, R.W. Sutter, W.A. Orenstein*

What are the Gaps in our Scientific Knowledge Relevant to Stopping Polio Immunisation? *D.J. Wood*

Session VII: Possible Strategies for Stopping Immunisation

Chairperson: *Sir Joe Smith*

Possible Global Strategies for Stopping Polio Vaccination and How They Could be Harmonized: *S.L. Cochi, R.W. Sutter, R.B. Aylward*

Possible Strategies for Stopping Immunisation: *D.J. Wood*

Session VIII: What Vaccines Could be Used Post Eradication if They Were Needed?

Chairperson: *John Petricciani*

Progress with Inactivated Poliovirus Vaccines Derived from the Sabin Strains: *Y. Doi, S. Abe, H. Yamamoto, H. Horie, H. Ohyama, K. Satoh, Y. Tano, Y. Ota, M. Miyazawa, K. Wakabayashi, S. Hashizume*

Inactivated Vaccines Based on Alternatives to Wild-Type Seed Virus: *K. Chumakov, E. Dragunsky, A. Ivshina, J. Enterline, V. Wells, T. Nomura, M. Gromeier, E. Wimmer*

Live-Attenuated Strains of Improved Genetic Stability: *A.J. Macadam, G. Ferguson, D.M. Stone, J. Meredith, J.W. Almond, P.D. Minor*

Vaccines Based on Recombinant Antigen Strategies: *P.D. Minor*

Poster Session II

Anomalous Observations on IPV and OPV Vaccination: *T.J. John*

Poster Session III

Evaluation of the New Control Methods for Oral Poliomyelitis Vaccine: *V.P. Grachev, G.G. Karganova, A.A. Rumyantsev, O.E. Ivanova, T.P. Ereemeeva, S.G. Drozdov*

Poliomyelitis in Russia in 1998-1999: *O.E. Ivanova, T.P. Ereemeeva, G.G. Karganova, A.A. Rumyantsev, E.V. Leshinskaya, G.Y. Lipskaya, E.A. Cherkasova, E.A. Korotkova, V.P. Grachev, S.G. Drozdov*

Inhibition of Poliovirus RNA Synthesis as a Molecular Mechanism Contributing to Viral Persistence in the Mouse Central Nervous System: *T. Couderc, S. Girard, I. Pelletier, A.S. Gosselin, J. Destombes, D. Thiesson, F. Colbère-Garapin, B. Blondel*

Outbreak of Paralytic Poliomyelitis in the Chechen Republic in 1995: *O.E. Ivanova, T.P. Ereemeeva, G.Y. Lipskaya, E.A. Cherkasova, E.V. Gavrilin, S.G. Drozdo*