



WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

MIM/PVD/86.6

ENGLISH ONLY

SCIENTIFIC ADVISORY GROUP OF EXPERTS,
PROGRAMME FOR VACCINE DEVELOPMENT

Distr.: LIMITED

Geneva, 14-16 July 1986 ;

REPORT
THIRD SESSION



The issue of this document does not constitute formal publication. It should not be reviewed, abstracted, quoted or translated without the agreement of the World Health Organization. Authors alone are responsible for views expressed in signed articles.

Ce document ne constitue pas une publication. Il ne doit faire l'objet d'aucun compte rendu ou résumé ni d'aucune citation ou traduction sans l'autorisation de l'Organisation mondiale de la Santé. Les opinions exprimées dans les articles signés n'engagent que leurs auteurs.

- i -

LIST OF PARTICIPANTS

Members

Professor G. Ada, Microbiology Department, The John Curtin School of Medical Research, P.O.Box 334, Canberra City, ACT 2601, Australia (Chairman)

Professor D. Baltimore,* Director, Whitehead Institute for Biomedical Research, Nine Cambridge Center, Cambridge, MA 02142, United States of America

Dr F. Brown, Wellcome Biotech, Ash Road, Pirbright, Surrey GU24 ONQ, United Kingdom

Dr W. S. Jordan,* Director, Microbiology and Infectious Diseases Programme, National Institutes of Health, Bldg. 31, Bethesda, MD 20205, United States of America

Dr F. Melchers,* Basel Institute for Immunology, Grenzacherstrasse 487, Postfach, CH-4005 Basle, Switzerland

Professor K. Murray, Department of Molecular Biology, University of Edinburgh, Kings Buildings, Mayfield Road, Edinburgh EH9 3JK, United Kingdom

Dr P. K. Russell, Deputy Commander, US Army Medical Research and Development Command, Fort Detrick, Frederick, MD 21701, United States of America

Dr T. Tada,* Department of Immunology, Faculty of Medicine, University of Tokyo, 7-3-1 Hongko, Bunkyo-ku, Tokyo 113, Japan

Dr K. Warren, Director for Health Science, Rockefeller Foundation, 1133 Avenue of the Americas, New York, NY 10036, United States of America

Professor R. Zinkernagel, Institute of Pathology of the University of Zurich, University Hospital, Schmelzbergstrasse 12, CH-8091 Zurich, Switzerland (Rapporteur)

Chairmen of Steering Committees:

Professor C. R. Pringle
Virus Laboratory
Department of Biological Sciences
University of Warwick
Coventry, CV4 7AL
United Kingdom

Acute Respiratory Viruses

Professor Bhamarapavati Natth
Rector, Mahidol University
2 Prannock Road
Bangkok 10700
Thailand

Dengue

* Unable to attend

...!

Dr M. J. Crumpton (for Dr J. McLeod Griffiss) Encapsulated Bacteria
 Imperial Cancer Research Fund Laboratories
 P.O.Box 123
 Lincoln's Inn Fields
 London, WC2A 3PX
 United Kingdom

Dr G. C. Schild Hepatitis A/Poliomyelitis
 Director, National Institute of
 Biological Standards & Control
 Holly Hill
 Hampstead, NW3 6RB
 United Kingdom

Dr B. Bloom (for Dr T. Godal) Tuberculosis
 Department of Microbiology and Immunology
 Albert Einstein College of Medicine of
 Yeshiva University
 Bronx, N.Y.
 United States of America

Secretariat

Dr F. Assaad, Director, Division of Communicable Diseases
 Professor P. W. Anderson, Department of Pediatrics, University of Rochester,
 School of Medicine and Dentistry, Rochester, N.Y., United States of America
 (Temporary Adviser)
 Ms R. Bell Madsen, Microbiology and Immunology Support Services
 Dr C. J. Clements, Expanded Programme in Immunization
 Dr J. Esparza, Microbiology and Immunology Support Services
 Dr Y. Chendon, Microbiology and Immunology Support Services
 Dr T. Godal, Director, Special Programme for Research and Training in Tropical
 Diseases
 Dr V. Gratchev, Biologicals
 Mr D. Griffin, Special Programme of Research, Development and Research Training
 in Human Reproduction
 Dr F. Hartvelt, United Nations Development Programme (UNDP), One United Nations
 Plaza, New York, NY 10017, United States of America
 Dr R. H. Henderson, Director, Expanded Programme on Immunization
 Dr S. K. Litvinov, Assistant Director General
 Dr J. Louis, WHO Immunology Research and Training Centre, Lausanne
 Dr F. Modabber, Trypanosomiasis and Leishmaniasis
 Dr A. Monto, Tuberculosis and Respiratory Infections
 Dr Y. Pervikov, Microbiology and Immunology Support Services
 Dr J. C. Petricciani, Chief, Biologicals
 Dr N. Pierce, Diarrhoeal Diseases Control
 Dr A. Pio, Chief, Tuberculosis and Respiratory Infections
 Dr P. Sizaret, Biologicals
 Dr D. Smith, Praxis Biologics, 300 East River Road, Rochester, NY, 14623,
 United States of America (Temporary Adviser)
 Dr E. D. Tikhomirov, Microbiology and Immunology Support Services
 Dr G. Torrigiani, Chief, Microbiology and Immunology Support Services
 (Secretary)
 Professor C. Zanussi, Via Boccaccio 25, 20123 Milan, Italy (Temporary Adviser)

- 1 -

CONTENTS

| | <u>Page</u> |
|--|-------------|
| 1. Opening of the meeting | 2 |
| 2. Summary and review of strategic plans | 2 |
| 3. Presentations on other WHO Programmes | 4 |
| 3.1 Special Programme of Research, Development and Training in Human Reproduction | 4 |
| 3.2 Special Programme for Research and Training in Tropical Diseases | 4 |
| 4. Related technical matters | 4 |
| 4.1 Applied vaccinology | 4 |
| 4.2 New vaccines: Considerations for studies of efficacy | 5 |
| 5. General matters | 5 |
| 6. Summary of budget | 6 |
| 7. Fund raising | 6 |
| 8. United Nations Development Programme (UNDP) | 6 |
| 9. Summary of approved expenditure | 6 |
| 10. Meetings in 1987 | 8 |
| 11. Membership of Steering Committees | 9 |

1. Opening of the meeting

Dr S. K. Litvinov, Assistant Director General, welcomed members of SAGE, Chairmen of Steering Committees (SC) and Temporary Advisers.

Professor R. Zinkernagel was elected Rapporteur for the meeting.

2. Summary and review of strategic plans

2.1 Dengue

The major aims (vaccine against all four major dengue virus serotypes) were summarized by Professor Natth Bhamarapavati. Antigenic epitopes and live attenuated vaccines were being defined and cellular and humoral immune responses were being studied. The possible use of the crab-eating monkey for testing neurovirulence instead of the rhesus monkey was being explored. The expression of protective epitopes, molecular definition of virulence and engineering of vaccines were the major future aims.

The Steering Committee proposed that Japanese encephalitis (JE) be included in the Programme as the study of this condition might help to understand dengue virus infection. The SC proposed to have a scientific meeting on the molecular biology of flaviviruses (including JE and yellow fever virus as vaccine carriers) in 1987. Dr P. K. Russell supported this proposal and indicated the likelihood of support from USA sources for a meeting at the time of the International Congress of Virology in Edmonton, Canada in 1987. WHO should prepare a request for support accordingly. The inclusion of JE in the Programme was approved by SAGE but a refined strategic plan should be prepared by the SC.

The limited immunology in the dengue programme, due mainly to the lack of animal models, was noted with concern; selection of future SC members must take this into consideration.

2.2 Encapsulated bacteria

Dr M. Crumpton reviewed this component of the Programme in the absence of the Chairman of the Steering Committee. The revised strategy attempted to focus on the development of a vaccine against meningococcal infections. Immunoepidemiology, antibody isotype, T-cell response, epitope characterization, vaccine development and support for core activities (monoclonal antibodies, serological and chemical assays) were considered of the greatest importance for the Programme.

Progress had been made on the production of monoclonal antibodies and an extensive collection was available, therefore only production of selected antibodies would be supported further. Serological assays (microbiological and Ig isotypes) would soon be completed and made available to research workers. Anti-idiotypic vaccine development was being tried. Gene transfer studies had been successful with gonococci. This approach would be extended to meningococci.

Studies on E. coli as a potential vector for meningococcal capsular polysaccharides would be included as from 1987.

Considerable progress had been made on epitope mapping. These efforts should probably be supported by the inclusion in the SC of a member with experience in molecular biology.

SAGE recognized the importance for the Programme of immunoepidemiology and the need to study the immune response (blocking IgA?, use of ELISA for detection of bactericidal antibody response etc.). However, the request for support for a visit to West Africa by the Chairman of the SC to plan an immunoepidemiological approach was not favoured. Such a visit was considered of limited value at present as the questions to be asked were not very clear.

SAGE commended the efforts to refocus the Programme but further efforts should be made to define the research strategy.

2.3 Tuberculosis

Dr B. Bloom presented the report of the Steering Committee, summarized the strategic plan and pointed out several newly added items. Tuberculosis was a forgotten disease, from the point of view of research and had, until recently, been supported mainly by this Programme. Monoclonal antibodies, genetic libraries, T-cell clone analysis were being used successfully. An epitope library was available and would allow successful search for determinants relevant to monoclonal antibodies and T cells. The SC did not propose to support further monoclonal antibody production and was restrictive on further T-cell clone analysis. The role of T-helper cells and killer-T cells in protection was now being reconsidered, since there was some evidence that T-helper cells and/or killer-T cells might be instrumental in destroying infected macrophages.

Since Mycobacterium tuberculosis and BCG could be grown, bacterial genetics was feasible. BCG was a potential carrier for recombinant material (advantages: widely used, very small risk, low costs, etc). M. tuberculosis mutants could also be developed. Molecular biological studies would be facilitated by the establishment of a bank of mycobacteria plasmids and phages.

Protective M. tuberculosis antigens, and particularly carbohydrate and glycolipid antigens, had been analyzed for their role in inducing or preventing induction of T help.

2.4 Respiratory viruses

The two viruses of greatest importance for the development of vaccines are respiratory syncytial virus (RSV) and parainfluenza 3 (PI3). In a general overview, Professor C. Pringle summarized the progress made, which had been very impressive. Although they cause quite comparable disease, RSV differed from PI since there were several additional genes in RSV. PI resembled more closely Rhabdovirus. RSV was of major concern to the Programme. The immune response was being analysed with the help of cloned genes, of vaccinia recombinants containing the various RSV genes and of monoclonal antibodies. The same was being done with PI3. Except for two (Newcastle UK; Rochester, NY, USA), most groups working in RSV research were involved in the Programme.

A current and future important area of research is the epidemiology (molecular, serological) of RSV. The evaluation of immune protection was being done successfully in cotton rats and mice. Humoral and cell-mediated immunity in these animal models was being studied with high priority. Passive immunization in animals and man with immune serum or monoclonal antibodies had clearly shown that antibodies did not cause exacerbation of disease, contrary to experience with a first formalin-inactivated RSV vaccine some years ago.

The SC proposed that research be commissioned on crystallographic studies of RSV, but SAGE considered this to be of rather low priority.

2.5 Hepatitis A (HA) and Poliomyelitis

Dr G. C. Schild recalled that the major aims of the Programme were the molecular characterization of the antigenicity and virulence of hepatitis A and polioviruses and the study of the immune mechanisms operating in those conditions. Recombinant and chimeric viruses had now been produced.

Epitope mapping, molecular mapping of virulence and evaluation of some studies on peptide vaccines had been concluded for poliomyelitis and were being planned for HA.

A bank of relevant molecular probes and of immunological reagents was being established and should be incorporated into the Programme.

As a tentative estimation, it was foreseen that a hepatitis A vaccine of one type or another may be available in the next five years; no decision had yet been taken on whether attenuated vaccine, protein or chimeric viral vaccine should be favoured.

The SC had recommended the addition of hepatitis non-A, non-B to the Programme. SAGE did not consider that the time was ripe to include hepatitis non-A, non-B in the Programme.

SAGE noted the oral report made by Dr Schild on a meeting in May 1986 on progress on picornavirus and influenza virus receptors, and on a meeting in July 1986 on the development of vaccine against hepatitis A and further progress on polio vaccines.

3. Presentations on other WHO programmes

3.1 Special Programme of Research, Development and Research Training in Human Reproduction (HRP)

Mr D. Griffin reported on the development of an anti-hCG vaccine that was undergoing testing in human volunteers in Australia. The vaccine consisted of a synthetic peptide conjugated to diphtheria toxoid and given in Arlcel together with an MDP derivative. Different groups of women would receive increasing amounts of the preparation. The groups so far immunized have received small amounts of the preparation. Antibodies had been produced but it seemed that this antibody response could be of short duration.

3.2 Special Programme for Research and Training in Tropical Diseases (TDR)

Dr F. Modabber reviewed the mechanisms of anti-leishmania immunity in experimental animals and presented the results obtained in some field trials of experimental vaccine in Brazil.

The results obtained so far in humans had not been conclusive and TDR was considering a field trial in Iran using a killed leishmania vaccine, taking advantage of the fact that this country was practising leishmanization in rural areas.

4. Related technical matters

4.1 Applied vaccinology

A position paper prepared by Dr K. Warren was discussed. The Task Force for Child Survival was coordinating efforts to vaccinate children in developing countries using the vaccines recommended by the Expanded Programme on Immunization. Existing vaccines were effective, but some of them required

multiple doses, rendering their administration difficult. It would be desirable to carry out studies to see if better vaccines (vaccines requiring, for instance, only one dose) can be developed by the use of improved carriers and/or adjuvants.

As some of these matters were of great interest to the Programme for Vaccine Development, it was suggested that one possibility would be to establish a joint group to study them. It was decided that the Chairman of SAGE should contact Dr W. Foegen, Chairman of the Task Force for Child Survival, to enquire about the possibility of organizing a meeting to define the areas of common interest. It was suggested that such a meeting could be convened at the UNDP headquarters in New York, USA on 24-25 October 1986. The following organizations should be invited: UNDP, World Bank, UNICEF and WHO. (In addition to the Programme for Vaccine Development (PVD), the following WHO programmes should be represented: Special Programme for Research and Training in Tropical Diseases (TDR), Diarrhoeal Diseases Control (CDD), Special Programme of Research and Development and Research Training in Human Reproduction (HRP.) It was anticipated that funds for the meeting would be provided by UNDP and The Rockefeller Foundation.

4.2 New vaccines: Considerations for studies of efficacy

A position paper prepared by Dr S. Krugman and Dr F. Robbins was presented by Dr F. Assaad.

New vaccines produced in different substrates were becoming available. It would be difficult, for ethical and financial reasons, to repeat field trials of every new vaccine developed using the new biotechnology in those cases where an effective vaccine already existed. This problem should be carefully studied. SAGE recognized the unique role that WHO could play in this area and recommended that WHO should pursue the subject further.

5. General matters

There was discussion as to how continuation of research within the Programme could or should be patented. It was generally felt that scientists should be encouraged to take out patents on products, in consultation with WHO (Legal Office).

The importance of fundamental immunology to vaccine development, was stressed, especially for some components of the Programme such as dengue and encapsulated bacteria. The possibility of changing/expanding the composition of the SCs accordingly, should be considered.

The total number of contracts had continued to increase, thanks to the advertising of the Programme. It was recommended that this should continue, especially through immunological society newsletters and immunological journals. It was recognized, however, that personal contact by SAGE and SC members might be more efficient than advertising in journals.

SAGE II had approved the provision of US\$15 000 for exceptional applications received between sessions of SCs (maximum US\$45 000 for the whole Programme). This year, exceptionally, such applications amounting to US\$57 000 were approved, because of mistakes by some SC Chairmen in indicating deadlines.

The following future meetings, related to the Programme, were briefly presented and noted:

(a) 9-11 October 1986, Geneva, Meeting on Carbohydrates as Antigens and Immunogens;

(b) Symposium on Infectious Disease, October 1987, supported by the Menarini Foundation, Italy.

6. Summary of budget

At the time of the meeting, contributions for 1986 had been received from Norway, Japan, The Rockefeller Foundation and Switzerland, totalling \$956 727. With the funds brought forward, \$795 666 (including interest), a total of \$1 752 393 was available. When the pledged contribution from the Glenmede Trust of \$750 000 was received, the total available for the Programme in 1986 would be \$2 502 393, of which \$439 918 had already been obligated, leaving \$2 062 475 available. The total itemized expenditure approved by SAGE (see p. 8) was \$1 969 025 plus Programme support costs = \$2 225 000, leaving a shortfall of \$162 525. If the Programme continued to grow at the same rate as in the past, the projected expenditure for 1987 would be over \$2 500 000. So far, WHO has received pledges for about \$1 500 000. Thus to ensure the steady growth of the Programme, it would be necessary to raise at least a further \$1 000 000. Contact had already been established with UNDP (see section 7) and with some governments with a view to raising this sum. For the biennium 1986/87 WHO had made available \$282 298 for meetings (SAGE, Steering Committees, etc.) and other costs.

7. Fund raising

Dr Assaad summarized the fund-raising situation and suggested that a sub-committee be formed to better structure efforts for fund raising. The aim was to raise about \$4-5 million per year. The Programme should be able to support the good and relevant proposals received. Members of SAGE agreed to assist in the preparation of a fund-raising dossier. The drafts prepared so far were considered unsatisfactory. Dr Assaad suggested that Dr K. Warren should chair the sub-committee. SAGE agreed and asked Dr Warren to form the sub-committee and to report to SAGE.

8. United Nations Development Programme (UNDP)

Mr F. Hartvelt explained aims of the United Nations Development Programme. Besides international, there were regional development programmes in basic, and applied research (agricultural, energy, health, sanitation), mainly in the areas of interest to developing countries. Within the health area vaccines (new or improved) were given high priority. UNDP planned to propose in the budget for 1987 a substantial amount to support the Programme for Vaccine Development.

9. Summary of approved expenditure

Dengue

A proposal had been received from a Cuban group but not recommended for funding until more information was received. SAGE felt that either the strain or the full sequence had to be made available to WHO before such a proposal could be supported.

The SC had reviewed four new proposals and recommended one for support. It had also reviewed 13 progress reports and recommended funding for 11. The total proposed expenditure of \$319 621 was approved.

Encapsulated bacteria

Support for the proposed scientific meeting in conjunction with an international meeting on Neisseria was refused on the grounds of cost, as too few of the principal investigators with WHO contracts planned to attend.

The SC had reviewed seven new applications and recommended two for support. It had also reviewed 10 progress reports and recommended funding for nine. The SC also recommended support for two late applications, making a total proposed expenditure of \$381 425, which was approved.

Tuberculosis

The SC had reviewed 23 new applications and recommended 12 for funding. The SC had also reviewed 12 progress reports and recommended them for funding. The total expenditure proposed was \$534 200 out of the budget provided of \$600 000.

Support was approved in principle for the proposed bank of monoclonal antibodies.

Acute respiratory viruses

The SC had reviewed eight new proposals and recommended support for four. The SC had also reviewed 12 progress reports and recommended 10 for funding. The SC had also recommended interim support for one late application. The total proposed expenditure of \$333 884 was approved.

SAGE also approved support up to \$5000 for a meeting on RS virus in collaboration with NIH, USA in early 1987. Continued support was also approved for the bank on monoclonal antibodies.

Hepatitis A/Poliomyelitis

Nine progress reports and 12 new applications (seven HA, five poliomyelitis) had been reviewed. Two of the new poliomyelitis applications and three of the HA were recommended for funding. Eight of the HA projects were recommended for renewal. Interim support was also recommended for a late application on HA. The total expenditure recommended was \$328 630 for HA and \$51 265 for poliomyelitis. This was approved, together with a maximum of \$5000 for a bank of reagents.

SAGE approved the recommended contract renewals and proposed new contracts for a total of US\$1 949 025 as follows:

| | | |
|---------------------------|-------------|-------------|
| Dengue | \$ 319 621 | |
| Encapsulated bacteria | \$ 381 425 | |
| Tuberculosis | \$ 534 200 | |
| Acute respiratory viruses | \$ 333 884 | |
| Hepatitis A/ | \$ 328 630* | |
| Poliomyelitis | \$ 51 265 | |
| | \$1 949 025 | \$1 934 025 |

SAGE also agreed to the following:

| | | |
|--|------------------|------------------|
| Three reagent banks (ARV, TB, Polio) | | \$ 15 000 (max.) |
| Scientific Meeting on Dengue | \$ 15 000 (max.) | |
| Meeting on respiratory syncytial virus | \$ 5 000 (max.) | \$ 20 000 |
| | | \$1 969 025 |

SAGE also approved a one-day visit by a member of the Steering Committee on Hepatitis A/Poliomyelitis to a contract holder (local visit).

A confidential summary account of the decisions taken by SAGE is given as an Annex.

10. Meetings in 1987

Hepatitis A/Poliomyelitis: 29-30 May 1987, London
Deadline for applications: 30 March 1987

Tuberculosis: 1-2 June 1987, Geneva
Deadline for applications: 1 April 1987

Dengue: 9-10 June 1987, Geneva
Deadline for applications: 9 April 1987

Acute Respiratory Viruses: 15-16 June 1987, Geneva
Deadline for applications: 15 April 1987

Encapsulated Bacteria: 22-23 June 1987, Geneva
Deadline for applications: 22 April 1987

SAGE IV: The meeting in 1987 will be held from 20 to 22 July in Geneva¹

* Including one project for which an interim award of \$15 000 had been made.

¹ Subsequently changed to 22-24 July 1987.

ANNEX

Summary of decisions taken by SAGE in closed session

The reports of the SCs were approved with the following reservations.

1. The contract with Dr Roux/Kolakofsky to be contingent upon two satisfactory referee reports.
2. A maximum of US\$15 000 was approved for a meeting on flaviviruses in conjunction with the International Congress of Virology in Edmonton, Canada in August 1987. It was expected that funds for this purpose would also be provided by a USA Government institution. So far as possible, invitees should be scientists already planning to attend the Congress. WHO support should be limited to one scientist per institution invited.
3. \$5000 to be provided to co-sponsor a meeting on respiratory syncytial viruses with the NIH (USA) early in 1987.
4. The 1987 session of the SC on ARV should take place in Geneva, not in London as proposed.
5. The proposal of the SC on Hepatitis A/Poliomyelitis to hold a meeting in Edmonton during the International Congress of Virology was not approved.
6. The inclusion of hepatitis non-A non-B in the Programme was not approved.
7. The inclusion of Japanese encephalitis in the Dengue Programme was approved.
8. The proposal by the SC on ARV to include support for crystallographic studies was considered premature.
9. It was confirmed that funds should not be used for buying computers.
10. The proposal of the SC on Hepatitis A/Poliomyelitis for a visit by Dr Fields to Dr Ennis's laboratory was approved.
11. It was confirmed that the upper limit for interim support should remain at \$15 000.
12. \$600 000 was approved as the upper limit commitment by the SC on Tuberculosis.

Membership of Steering Committees

The following changes were recommended:

Dengue

- | | |
|-----------------------------|--|
| To retire: | Dr B. Gorman, Queensland Institute of Medical Research, Brisbane, Australia |
| To be extended for 3 years: | Dr W. E. Brandt, USA Medical Material Development, Frederick, MD, United States of America |
| To be extended for 2 years: | Dr D. S. Burke, Chief, Department of Virus Diseases, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, DC, United States of America |

To be extended for 3 years: Dr S. B. Halstead, The Rockefeller Foundation,
New York, NY, United States of America

To be appointed for 3 years: Dr S. K. Lam, Department of Medical Microbiology,
University of Malaya, Kuala Lumpur, Malaysia

To be appointed for 3 years: Dr A. Igarashi, Institute for Tropical Medicine,
Nagasaki University, Nagasaki, Japan 852

Encapsulated Bacteria

To retire: Dr B. M. Greenwood, Medical Research Council
Laboratories, Fajara, Nr Banjul, The Gambia

Dr P. Helena Makela, National Public Health
Institute, Helsinki, Finland

To be extended for 2 years: Dr M. A. Apicella, Infectious Diseases Division,
Department of Medicine, Faculty of Health Sciences,
Erie County Medical Center, Buffalo, NY, United
States of America

To be appointed for 3 years: Dr E. R. Moxon, University of Oxford, Department of
Paediatrics, John Radcliffe Hospital, Headington,
Oxford, United Kingdom

The appointment of further members to this SC will be considered after the
meeting on Carbohydrates as Antigens and Immunogens in October 1986.

Tuberculosis

To retire: Dr T. Godal (formerly Radiumhospitalet, Oslo,
Norway)

To be appointed for 3 years: Professor B. Bloom, Department of Microbiology and
Immunology, Albert Einstein College of Medicine
of Yeshiva University, Bronx, NY, United States of
America (as Chairman)

To be appointed for 3 years: Professor R. W. Davis, Department of Biochemistry,
Stanford University School of Medicine, Stanford,
CA, United States of America

To be appointed for 3 years: Dr G. Bjune, Laboratory for Medical Microbiology,
Oslo University, Ullevål, Oslo, Norway

Acute Respiratory Viruses

To retire: Dr Brigitte A. Askonas, National Institute for
Medical Research, Mill Hill, London, United
Kingdom

To be extended for 1 year: Dr R. M. Chanock, Laboratory of Infectious
Diseases, National Institute of Allergy and
Infectious Diseases, National Institutes of Health,
Bethesda, MD, United States of America

- 11 -

- To be extended for 1 year: Dr D. Kolakofsky, Département de Microbiologie, Centre médicale Universitaire, Geneva, Switzerland
- To be extended for 2 years: Dr E. Norrby, Department of Virology, Karolinska Institute, Stockholm, Sweden
- To be extended for 3 years: Dr Gail W. Wertz, Department of Microbiology and Immunology, School of Medicine, University of N. Carolina, Chapel Hill, NC, United States of America
- To be appointed for 3 years: Dr A. MacMichael, Nuffield Department of Clinical Medicine, John Radcliffe Hospital, Headington, Oxford, United Kingdom

Hepatitis A/Poliomyelitis

- To retire: Dr M. S. Balayan, Institute of Poliomyelitis and Viral Encephalitis, Moscow, USSR
- Professor F. Deinhardt, Max von Pettenkofer Institute, Munich, Federal Republic of Germany
- To be extended for 2 years: Dr J. W. Almond, Department of Microbiology, University of Reading, Reading, United Kingdom
- To be extended for 1 year: Dr R. H. Purcell, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD, United States of America
- To be appointed for 3 years: Dr A. Nomoto, Department of Microbiology, University of Tokyo, Faculty of Medicine, Hongko, Tokyo, Japan
- To be appointed for 2 years: Dr J. M. Hogle, Scripps Clinic and Research Foundation, La Jolla, CA, United States of America
- To be appointed for 2 years: Dr V. Lashkevich, Institute of Poliomyelitis and Viral Encephalitis, Moscow, USSR

* * *

Professor K. Murray announced that he did not wish to be considered for extension as a member of SAGE. His contribution to the Programme was recognized and he was thanked.