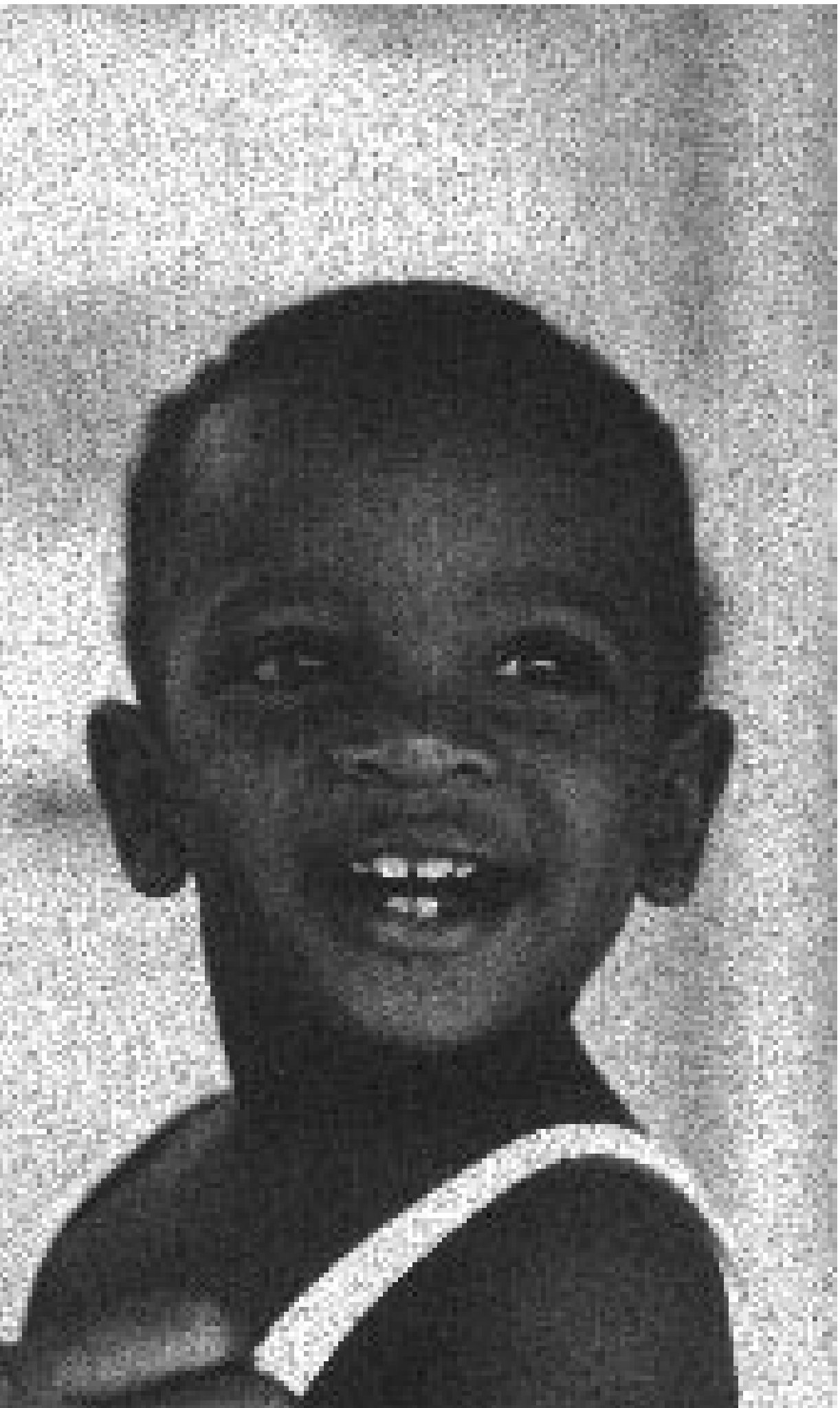
C V I F O R U M



Number 4
July 1993

In this Issue

Jamaica puts muscle into measles immunization

2.

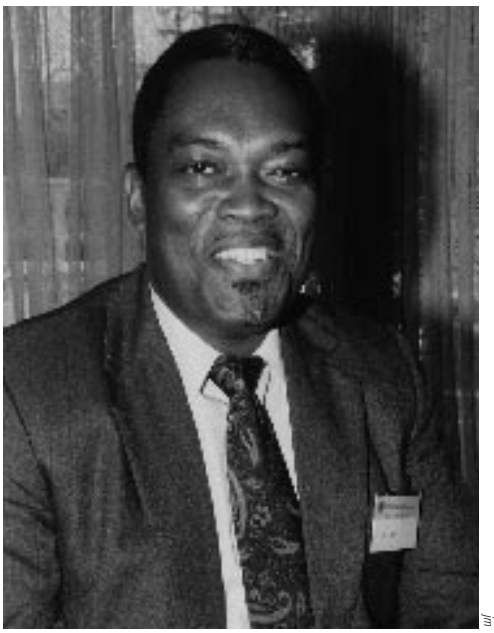
"...they just don't realize that measles can carry a high mortality rate."

One of Jamaica's most urgent tasks in the health sector is to increase coverage of its children with measles vaccine, says Barry Wint, Chief Medical Officer of the island's Ministry of Health. But overcoming widespread apathy about the disease "won't be easy," he admits. Many Jamaicans, especially in rural areas, "don't see measles as a serious threat to their health," despite "a fairly big" epidemic that occurred in 1990, producing significant morbidity and tying up the resources of an already strained health system.

In fact, if coverage rates are any guide, public concern about measles may even be declining: only 63% of children under 12 months of age were vaccinated in 1992 – the second-lowest rate in the Americas (after Venezuela, with 61%) – vs. 77% in 1991. (The overall 1992 coverage for the Americas was 81% and for the world, 78%.)

A campaign to raise parents' awareness of the disease and its dangers is under way, with messages being delivered through the electronic media, especially radio, and via parent-teacher groups, community councils and the like. "People are scared of tetanus, whooping cough and diphtheria," notes Dr Wint. "And of course polio. But they just don't realize that measles can carry a high mortality rate."

Other obstacles to increasing measles vaccine coverage in Jamaica are an acute shortage of health personnel, the cost of the vaccine (currently US$35,000 a year) and the logistics of ensuring adequate supplies of immunization "accessories," like needles, syringes, etc. Maintenance of cold-chain



Barry Wint

equipment, especially refrigerators, is also proving troublesome.

As for vaccine supply, notes Dr Wint: "We still occasionally run out of vaccine, and that certainly affects our immunization programmes." Part of the problem, he says, is the current "economic crunch," which is forcing the finance ministry to make cash allocations only on a monthly basis. "That creates havoc in trying to procure vaccines from overseas. We can no longer plan bulk purchases for a year's supply." Jamaica's health ministry is developing a bulk order system involving intermittent supply dates and a corresponding payment schedule, "instead of having to find all the money up front." Novel procurement systems, including "some kind of bid process," should also help the island weather rising vaccine prices,

Cover photo: Cam/Len Sirman

UNICEF/Cunningham

Land of sun... but also song, Jamaica uses all available means to inform its people about health and disease—particularly measles – in its current awareness-raising campaign.

Dr Wint says. But he is worried: "All our objectives are going to be shot if those costs aren't controlled."

Given three wishes, Dr Wint would ask for:

- "a guaranteed, non-interrupted supply of vaccine;"
- "some way of keeping my staff" – Jamaica is currently losing annually 20% of nurses and doctors to more lucrative climes;
- "a more understanding, compliant public."

"All our objectives are going to be shot if those costs aren't controlled."

IN A NUTSHELL

Population:	**2.5 million[1]**
No. of births a year:	**59,000[2]**
Infant mortality rate:	**25 per 1,000 live births[3]**
Under-5 mortality rate:	**20 per live births[3]**
% of national budget for health:	**5-6[2]**
Human development rank:	**69[3]**
Main immunization thrusts:	**polio, measles, rubella, tetanus, diphtheria[2]**
Priority vaccine needs unmet:	**HIV, typhoid, hepatitis B[2]**
Major health concerns:	**gastroenteritis, dengue, respiratory tract diseases, gonorrhoea, syphilis, AIDS, traffic and other accidents and violence, diabetes, cholera[2]**
Major ongoing health measures:	**strengthening district health systems, closer integration with private and nongovernmental care providers, training of paramedicals, more emphasis on hospital user charges and generic prescribing[2]**

Sources: 1. UN Population Division, 1992 estimate. 2. Government of Jamaica. 3. UNDP, Human Development Report 1993.

CVI Ad Hoc Committee on Measles

Measles: an action agenda for the next decade

Nearly 80% of the world's children are immunized against measles and an estimated 1.9 million deaths from this disease are prevented annually. Yet, about 1.4 million children still die from measles every year, according to WHO estimates.

These seemingly paradoxical figures were the backdrop for a meeting last March in Bellagio, Italy, of a CVI Ad Hoc Committee that brought together some 30 experts in epidemiology, virology, immunology, health economics and measles control programmes to work out an investment strategy for improving measles control throughout the world. Before doing so, though, the Committee reviewed data on the current measles situation, noting that:

- measles causes more deaths in children than all the other diseases preventable by vaccination taken together;
- the measles virus is believed to cause more deaths in children than any other single pathogen;
- in developing countries, acute measles infection carries a case-fatality rate ranging from 3 to 15%, depending on age (highest when contracted early in life);
- measles infection itself causes disease and death but by involving the respiratory and gastrointestinal tracts and also the cells of the immune system it can cause pneumonia and diarrhoea that may result in disease and death over subsequent weeks;
- the current measles vaccines, composed of attenuated live measles virus, are safe and effective but if they are given to infants who still have anti-measles antibodies acquired in the womb from their mothers, the vaccines can be neutralized by these antibodies: in areas where "wild" measles virus is circulating in the community, infants may contract measles during a "window of susceptibility",

The measles virus is believed to cause more deaths in children than any other single pathogen.

Measles Ad Hoc Committee members take a picture break during their meeting at the Rockefeller Foundation's study and conference center in Bellagio, Italy.

i.e. shortly after their levels of maternal antibodies have dropped but before they are protected by immunity from a measles vaccine;

- in some settings, where 90% or more of children have received a measles vaccine by the age of nine months or older, "herd immunity" limits the spread of measles virus in the community (since it is transmitted from person to person during the acute phase of the infection) and thus reduces measles-related disease and death in children too young to have been vaccinated;
- since it may be difficult to achieve and sustain such high levels of coverage globally, a vaccine that can be given at or shortly after birth would greatly improve the chances of doing so and thereby of controlling and possibly even eradicating measles: not only would such a vaccine close the window of susceptibility to infection but more infants could be reached at this time.

The CVI Committee called for a "balanced investment strategy" to foster synergism between two approaches: more widespread use of current vaccines, on the one hand, and, on the other, a greater scientific understanding of measles so that a new and better vaccine might be developed that would improve control efforts.

A full report of the meeting, detailing the scientific priorities envisaged under the proposed investment strategy, is available from : Dr Lindsay Martinez, CVI Executive Secretary, WHO/CDS, 1211 Geneva 27, Switzerland [fax: 41-22/788-2736].

See also *Progress Report* on an improved measles vaccine, page 8.

A vaccine that can be given at or shortly after birth would greatly improve the chances of ... controlling and possibly even eradicating measles.

PROGRESS REPORT

from the CVI's Task Forces and Product Development Groups

Task Force on Priority Setting and Strategic Plans

Terms of reference

To advise the CVI on priorities for action on new products, on the possible creation of new task forces or product development groups, on regular updating of the CVI's strategic plan and on resource allocation, and to monitor progress being made by other task forces and product development groups.

Update of activities

In March 1993 the Task Force convened an international consultation in Geneva on combination vaccines, which concluded, among other things, that:

- the introduction and widespread use of an acellular pertussis vaccine in developed countries would not necessarily lead to a double standard whereby developed countries would have a "good" vaccine and developing countries a "bad" vaccine: the current widely used whole-cell pertussis vaccine is safe and effective and the choice between the two will depend on cost and legal considerations, and to what extent the whole-cell vaccine can be improved so as to reduce the risk of side-effects (notably, fever and local irritation);
- combination vaccines using diphtheria-tetanus-pertussis vaccine (DTP) as a base will require a more purified DTP: the search for such vaccines will therefore require developing countries to upgrade their production procedures in order to obtain such a more purified DTP, which will in turn better equip them to produce more effective, safer and more immunogenic vaccines;
- among combination vaccines, a DTP-hepatitis B vaccine should be the first to be developed: by reducing the technical and logistic requirements of separate immunizations, it may be the most cost-effective way of integrating hepatitis B vaccine into the national childhood immunization programmes of all countries by 1997 – a target of the Expanded Programme on Immunization (EPI), endorsed by the 1992 World Health Assembly;
- setting priorities for the development of combination vaccines should take into account the differing needs of countries for such vaccines.

Task Force on Quality Control and Regulatory Procedures

Terms of reference

To evaluate and, if necessary, strengthen national licensing procedures to assure the quality of vaccines used in immunization programmes.

Update of activities

At its May 1993 meeting the Task Force reviewed its activities to date. Over the past year it has sent assessment teams to six countries – Bangladesh, China, Egypt, Mexico, Pakistan and Viet Nam. Two of these visits (to Bangladesh and Egypt) were made jointly with teams from the Task Force on Situation Analysis. Overall, the teams:

- noted that some countries did not have an independent national control authority or licensing authority and that where monitoring facilities existed there was scope for improvement in vaccine licensing procedures;
- made recommendations for upgrading vaccine production facilities and setting up or improving quality control facilities.

Future visits are planned in the near future to Brazil, India, Indonesia, Iran and Mexico (which requested a follow-up visit).

In most developing countries, governments do not always appreciate the need for an independent national control authority to monitor local vaccine production.

Comment

by David Magrath, Task Force Secretary

Vaccine manufacturing facilities are state-owned in most developing countries, whose governments do not always appreciate the need for an independent national control authority to monitor local vaccine production. Moreover, although legislation governing vaccine production invariably exists, it is sometimes not adequately enforced. The result is that vaccine quality usually depends solely on the manufacturer's competence and integrity. But in some countries, the licensing authority is unclear about what action it is authorized to take with regard to a state-owned production facility found to be producing defective vaccines. The Task Force hopes that governments will act on the recommendations for improving the quality control of locally produced vaccines. It is willing to help countries organize workshops where national legislation and licensing procedures could be reviewed and suggestions made for their improvement. The International Federation of Pharmaceutical Manufacturers Associations, for their part, has offered to assist in the publication of training documents.

Task Force on Situation Analysis

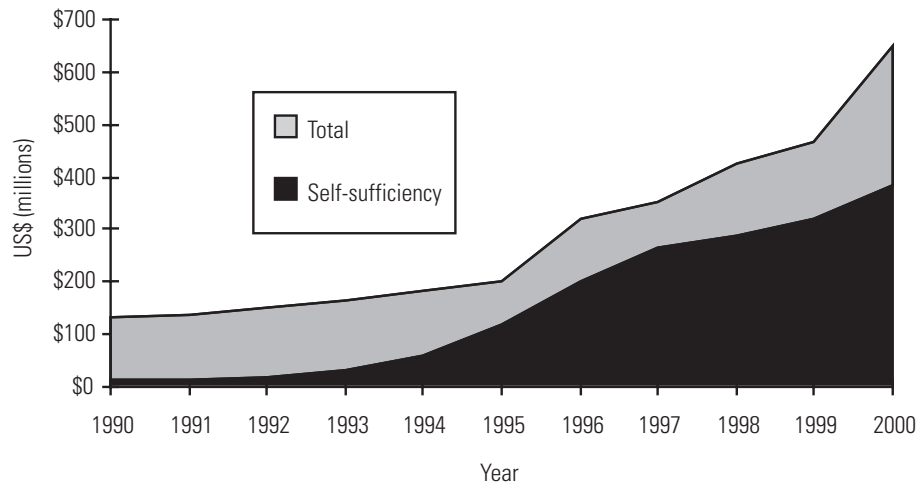
Terms of reference

To assess the global demand, supply and funding of children's vaccines, and to facilitate and monitor the efforts of countries to increase their self-sufficiency in vaccine production and/or procurement.

Update of activities

The Task Force has developed a "self-sufficiency" indicator that can be used to assess the extent to which a country has achieved or is on the way to achieving a sustainable vaccine supply (see graph). This indicator is the total quantity in US dollars of

Total Vaccine Need and Country Self-Sufficiency



This graph illustrates the hypothetical advance of an imaginary country towards self-sufficiency in vaccine supply, as measured by the self-sufficiency indicator introduced by the CVI's Task Force on Situation Analysis (see text), plotted here in relation to the country's total vaccine needs. Fluctuations in total vaccine needs can result from the introduction of new vaccines. Fluctuations in self-sufficiency can result from changes in (1) the quantity of vaccine known to be of good quality (as distinct from vaccine of unknown quality), (2) the extent of financing of the country's vaccine supply through mechanisms such as the Vaccine Independence Initiative or (3) the capacity of local vaccine production. The graph, however, does not address the question of how the country might narrow the gap between supply and demand.

vaccine of known good quality supplied in a timely fashion and financed by the country. It is an absolute measure of one aspect of *self-sufficiency* and should be considered in relation to another, namely, the country's *total vaccine needs*. For practical purposes, the Task Force has identified three *relative* indicators that give a more precise measure of a country's progress towards vaccine self-sufficiency:

- *Quality:* percentage of doses of vaccine of known good quality that are used in a country in relation to the total number of vaccine doses used
- *Supply:* percentage of total vaccine demand (as defined by the country) that is met in a timely fashion by the country
- *Financing:* percentage of vaccine doses financed by the country.

The Task Force recently visited Pakistan, whose National Institute of Health produces measles vaccine, fills/finishes bulk oral polio vaccine (OPV) and is developing its capacity to produce tetanus toxoid vaccine (TT). It imports, through UNICEF, TT, DTP and BCG. With relatively little investment, Pakistan could, the team found, become self-sufficient in its production of measles vaccine, which is of good quality, and could meet its extra OPV needs by changing the dose size of OPV vials being filled from bulk.

In the autumn of 1993, the Task Force will conduct a study of the vaccine industry, analyzing its size, market share and dynamics, the economic factors affecting the major categories of vaccine producers and the impact of changes in demand relating to vaccine quantity, type, source, price, etc.

Comment

by Peter Evans, Task Force Secretary

Indicators of the type proposed by the Task Force could prove extremely useful both to the CVI in setting goals – global, regional and national – for vaccine self-sufficiency and to countries wishing to monitor their progress towards achieving these goals. In particular, they provide the Task Force with a measure of the impact of the different activities, strategies and initiatives designed to strengthen a country's vaccine supply system (such as the Vaccine Independence Initiative – the joint UNICEF/WHO scheme which uses several mechanisms to provide supportive services to countries seeking greater independence in procuring vaccines – or recommendations that a country strengthen its quality control or expand its production capacity). The goal of self-sufficiency lies at the interface between the priorities of the EPI, with its emphasis on a stable supply of existing vaccines, and those of the CVI, which is working towards the vaccines of the future. In this sense, achieving self-sufficiency in vaccine supply reflects a country's readiness to introduce into its immunization programmes the new and better vaccines that should be available in coming years.

Product Development Group for Development of a Thermostable Oral Poliomyelitis Vaccine

Terms of reference

To promote and manage the industrial development of a heat-stable oral polio vaccine (OPV) capable of withstanding at least seven days at a temperature of 45°C without losing more than 0.5 $\log_{10}$ potency for each of the three vaccine virus serotypes.

Update of activities

New data presented to the Group at its April 1993 meeting prompted it to abandon one of the two stabilizing approaches being explored, namely, use of compounds that bind to the hydrophobic pocket of the poliovirion. The most promising of these compounds, pirodavir, stabilizes the antigenic structure of the virus but not its infectivity.

The second approach to stabilization is drying of the vaccine. Two techniques remain under consideration: air-drying in the presence of the sugar trehalose and lyophilization. With both approaches the extensive drying needed to produce a vaccine with the required stability results in an unacceptably high loss of infectivity. Less extensive drying allows retention of virus infectivity but results in a less stable product. The reduction of infectivity on exposure to 45°C appears to be associated with degradation of viral RNA. The Group is supporting further work by the collaborating research teams aimed at refining these drying techniques in order to produce a dried vaccine that is stable at 42-45°C and that has not lost a significant degree of potency during the drying process.

A by-product of the Group's activities has been the demonstration by one of the teams that a novel combination of conventional stabilizers can stabilize all three serotypes of the current OPV up to seven days at a temperature of 37°C with a loss of potency of less than 0.5 $\log_{10}$. Preliminary discussions with licensing authorities suggest that the new combination would not pose regulatory problems. This degree of thermostability, if achieved for all OPV that is used in immunization programmes (and that is currently required to withstand two days at 37°C), would have a positive impact on these programmes.

Comment

by Julie Milstien, Group Secretary

The product development approach being used by the Group will result in real improvements in OPV: the

Self-sufficiency in vaccine supply reflects a country's readiness to introduce into its immunization programmes the new and better vaccines.

latest UNICEF tender invites manufacturers to bid on OPV with improved stability (37°C for seven days), as well as on the currently available product (37°C for two days). OPV of the higher stability, used in conjunction with vaccine vial indicators (that are also included in the new UNICEF tender), has the potential to greatly increase the flexibility of OPV use in polio eradication programmes and to decrease vaccine wastage. The result should allow funds used to purchase vaccines to go further to help alleviate the current funding crisis in polio vaccine supply.

Product Development Group on a Single-Dose Tetanus Toxoid Vaccine

Terms of reference

To promote and manage the industrial development of a single-dose, controlled-release tetanus toxoid (TT) vaccine to be used for maternal immunization against neonatal tetanus.

Update of activities

At its March 1993 meeting, held jointly with the WHO/UNDP Programme for Vaccine Development (PVD), the Group noted that some formulations of TT-containing microspheres give, in a single dose, immune responses as good as or better than can be achieved with a single dose of conventional alum-adsorbed TT vaccine, but that they cannot deliver both priming and boosting doses to the extent achieved with the two doses of conventional TT vaccine. There is evidence that the problem may lie in a lack of stability of the microencapsulated antigen at 37°C, but the possibility of poor antigen presentation to the immune system cannot be ruled out. The Group, working in conjunction with the PVD, has commissioned a special investigation into this problem.

Comment

by Teresa Aguado and Paul-Henri Lambert, Group Secretaries

The stability problem that the Group is encountering could lead to a delay of one-to-two years in its original schedule. A strategic research plan has been worked out for 1993-94 that will determine whether the problem can be solved and if so, whether the Group's ultimate goal is still achievable. As a whole, the Group is confident that the animal studies it will sponsor under its new plan will show that it is. Whatever the outcome of the Group's current activities, though, it is already clear that the microencapsulation technology being used by the collaborating research teams may well have significant applications to other antigens.

It is already clear that the microencapsulation technology being used by the collaborating research teams may well have significant applications to other antigens.

Product Development Group on an Improved Measles Vaccine

Terms of Reference

To facilitate the industrial development of an improved measles vaccine that can be given to infants before six months of age.

Update of Activities

At its first formal meeting, held in Bellagio, Italy, in March 1993, the Group highlighted several hurdles to fulfilling its mandate. These include:

- the risk of atypical measles, a severe syndrome that occurred in the 1960s in recipients of inactivated viral vaccines who were subsequently exposed to natural measles virus: the Group will reproduce this syndrome in animals and identify the serological markers associated with it;
- an inadequate understanding of the full scope of immune mechanisms in measles: the Group will encourage research on humoral, secretory and cell-mediated immune responses and the development of tests of cell-mediated immunity; it will also seek a better understanding of (1) the "immunodisruptive" effects of measles virus and measles vaccine infection, (2) the depressive effects of maternal immunity on measles infection in infants and (3) the effects of maturation of the immune system on the response to measles infection.

The Group formulated a *product development plan*, which envisages an initial two-year phase during which the Group will commission:

- studies in primates that will compare immune responses to live vaccines, inactivated vaccines and the two potential candidate vaccines mentioned above;
- development of simple methods of examining the immune responses of human and primate vaccine recipients, i.e. assays for total antibody against specific viral proteins and assays to measure functional antibodies against viral proteins;
- studies, conducted through the PVD, on alternative approaches to better measles vaccines.

See also *Special Report* on a CVI Ad Hoc Committee on Measles, page 4.

CVI Wire

FROM the PVD

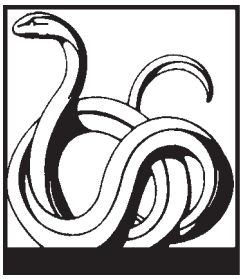
•A cholera epidemic in South-East Asia due to a new strain of *Vibrio cholerae* could flare into a major pandemic, experts of the WHO/UNDP Programme for Vaccine Development (PVD) warned at a meeting last June in Geneva. They made a strong appeal to the PVD to accelerate work on a vaccine against the new strain. Since the beginning of the year 108,000 cases and over 1,500 deaths have occurred in the Indian subcontinent as a result of the epidemic, although estimated figures are much higher. Most people in the area, especially adults, are immune to the widely prevalent 01 strain of the bacterium but completely unprotected against the new strain. The currently available cholera vaccines, which provide up to 60% protection against 01 *Vibrio*, appear to be ineffective against the new strain. The experts, members of the PVD's Scientific Advisory Group of Experts (SAGE), urged the PVD to launch a US$2 million crash programme to produce a candidate vaccine by the end of the year that would be ready to go into field trials early in 1994. The PVD has already sent a team to the area of the epidemic to gather data on the new strain and has prepared a strategy for producing a new vaccine.

•The SAGE also called for closer links between the PVD, with its emphasis on "upstream" research and development, and the CVI, which it sees as concentrating on industrial vaccine development. As a step towards closer collaboration, the SAGE will review the scientific progress of the CVI's Product Development Groups.

•*Ten Years of Progress 1984-1993*, a 34-page brochure describing the PVD, its goals and activities, and placing them in the context of the world's vaccine needs, has just been published and is available to interested readers.

Information from: Dr Paul-Henri Lambert, Microbiology and Immunology Support Services, WHO, 1211 Geneva 27 [tel: (41-22) 791-3282; fax: (41-22) 788-2937].

FROM the IOM



The Children's Vaccine Initiative: Achieving the Vision is the title of a new report by the Institute of Medicine (IOM) of the United States National Academy of Sciences. The report is the work of an 18-member committee convened by the IOM to identify impediments to the development of new and improved vaccines and to recommend how best the U.S. could contribute to the CVI through its public *and* private sectors. The report was released in Washington, D.C., on 1 July 1993.

The Committee notes the extremely low U.S. "series-complete" immunization levels in under-two-year-olds (for DTP, polio and MMR) – 10-42% according to a recent Centers for Disease Control study. Clearly, the Committee argues, the U.S. would benefit from the CVI's goals of single-dose multicomponent vaccines, that should make it easier to increase immunization coverage.

Most people in the area, especially adults, are ... completely unprotected against the new strain.

What, the report asks, could the U.S. contribute to the CVI? The answer: its enormous vaccine research and development capability. The IOM Committee believes that, despite the estimated US$250 million a year of public sector spending on adult and paediatric vaccine research, the U.S. Government is not active – especially proactive – enough in pushing vaccines through the country's vaccine development system. What's more, this system, the Committee says, is saddled with a critical bottleneck – a shortage of facilities for pilot production of vaccines. Current capacity to produce pilot lots of vaccines for human trials in the U.S. rests almost entirely with private manufacturers, for whom the CVI vaccines are of low commercial interest and consequently of low priority.

Current capacity to produce pilot lots of vaccines for human trials in the U.S. rests almost entirely with private manufacturers, for whom the CVI vaccines are ... of low priority.

The Committee recommends that the U.S. create a National Vaccine Authority, which would help *push* vaccine development by working with the CVI to set vaccine priorities, by brokering contractual agreements with biotechnology firms and by providing them with a government-owned Good Manufacturing Practice pilot facility where they could work on commercially unattractive vaccines. This institution could also help *pull* vaccines out of the development mill by arranging and subsidizing procurement so as to maintain an acceptable degree of incentive among private sector developers.

Copies of the IOM report (The Children's Vaccine Initiative: Achieving the Vision, *221 pp., US$24.95*) *are available from: National Academy Press, 2101 Constitution Avenue, N.W., Box 285, Washington, D.C. 20418 [tel: (202) 334-3313; fax: (202) 334-2793].*

FROM the RIVM

The Immunobiology Laboratory of the Netherlands' National Institute of Public Health and Environmental Protection (RIVM) has developed an animal model for measles. The model consists of measles virus infection of cynomolgus monkeys (*Macaca fascicularis*). The virus strain (MV-BIL) used to infect the monkeys was recently isolated in the Netherlands from a patient with acute measles. The model was developed at the request of the PVD for preliminary safety and efficacy testing of new candidate measles vaccines.

Measles virus does not infect macaques under natural circumstances, but the animals can be infected from contact with infected humans. Animals infected by intratracheal administration of the human virus develop mild signs of measles, such as fever and lethargy, and a typical skin rash may be seen. Virological and immunological findings are similar to those seen in human subjects. By contrast, rodents, which have been used in the past as models for measles virus infection, do not develop the disease pattern seen in humans, but may still be used as models for measles virus infection of the nervous system.

Further information from: Prof Albert D.M.E. Osterhaus, Head, Laboratory of Immunobiology, RIVM, Bilthoven, Netherlands [tel: (31.30) 74.91.11; fax: (31.30) 74.29.71].

Survey of global investment in R & D on children's vaccines

The CVI Secretariat in Geneva has made a survey of worldwide investment in research and development on children's vaccines. The survey canvassed a wide range of institutions, including national and international funding organizations, private and public sector vaccine producers, foundations and research councils. The report of the survey covers information received from 55 institutions and companies. It lists their vaccine-related activities and, where data are available, the resources invested in these activities. The survey will be updated periodically. Organizations not included in this first report are invited to contribute to subsequent editions.

For a copy of the report (free of charge) write to: Dr Lindsay Martinez, Children's Vaccine Initiative, WHO/CDS, 1211 Geneva 27, Switzerland [fax:41-22/788-2736].

Meeting Calendar

Readers organizing public meetings on topics related to vaccines are invited to submit announcements of such meetings giving the exact title, date and place of the meeting, as well as the name, address, telephone and fax numbers of a contact person, to The Editor, CVI FORUM (see address and fax number on back page). CVI FORUM cannot accept responsibility for errors in items published in this calendar. However, information is welcomed from readers who notice such errors.

8-13 August 1993
Glasgow, UK

9th international congress of virology

D.H. Watson, Chairman, National Organizing Committee, University of Leeds, Leeds LS2 9JT, UK

15-21 August 1993
Birmingham, UK

17th international congress of genetics

Prof D. R. Smith, Secretary General, Research Support and Industrial Liaison, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

24-26 August 1993
Houston, TX, USA

BioInternational '93 conference and exhibition

Conference Secretariat, BioExpo Management, 1635 W. Alabama, Houston, TX 77006, USA

31 August-4 September 1993
Oxford, UK

3rd international symposium on solid phase synthesis, biological and biomedical applications

Prof Roger Epton, SPS Conference Secretariat, P.O. Box 13, Kingswinford, West Midlands, DY6 0HQ, UK

7-9 November 1993
Kyoto, Japan

3rd meeting of the CVI Consultative Group

Will include presentations on: **Research towards a new generation of vaccines** (Sir Gustav Nossal); **Vaccine self-sufficiency and quality assurance** (Dr I. Arita); **Eradication of poliomyelitis** (Dr C.A. de Quadros); and sessions on**: Global strategy and future implementation of the CVI, progress and perspectives on combination of antigens, global vaccine supply, technology transfer and development plans, role of collaborating agencies to promote vaccine self-sufficiency.**

Dr Isao Arita, Chairman, Agency for Cooperation in International Health, 4-11-1 Higashi-machi, Kumamoto City 862, Japan. Fax: (81-96) 367-9001

6-10 September 1993
Paris, France

Immunopotentiators in modern vaccines

Mr John Herriot, Meetings Management, Straight Mile House, Tilford Road, Rushmoor, Farnham, Surrey GU10 2EP, UK

8-10 September, 1993
Cambridge, UK

Fluorescence *in situ* hybridization for cytogenetics and molecular genetics

Susie Reis, Course Administrator, Programme for Industry, University of Cambridge, 1 Trumpington Street, Cambridge CB2 1QA, UK. Tel: (44-223) 332-722; Fax: (44-223) 301-122

12-15 September 1993
London, UK

7th international congress on rapid methods and automation in microbiology and immunology

Ms Pauline Dudgeon, RAMI-93 Secretariat, Sleights Limited, 14 Dalling Road, London W6 0JB, UK

16-17 September 1993
London, UK

Business restructuring in the pharmaceutical industry

Lucinda Middleton, IBC Technical Services Ltd., Gilmoora House, 57/61 Mortimer Street, London W1N 7TD, UK

20-24 September 1993
Cold Spring Harbor, NY, USA

Modern approaches to new vaccines including the prevention of AIDS

Meetings Coordinator, Meetings and Courses Office, Cold Spring Harbor Laboratory, Box 100, 1 Bungtown Road, Cold Spring Harbor, NY 11724-2213

30 September-1 October 1993
Gent, Belgium

Forum for applied biotechnology

Conference Secretary, Administrative Centre FAB, p/a GOM, West-Vlaanderen, Baron Ruzettelaan 33, B-8310 Assebroek/Brugge, Belgium

30 September-2 October 1993
Bordeaux, France

2nd international congress on ultra-low doses

Congress Secretariat, Congress U.L.D., Laboratoire d'Hématologie, 3 Place de la Victoire, 33076 Bordeaux, France

Continued on next page

17-21 October 1993
Veyrier du Lac Annecy, France

1st international workshop on platelets, endothelial cells: from autoimmunity to immunomodulation

Dr C. Kaplan, I.N.T.S., 6 rue A. Cabanel, 75015 Paris, France

19-21 October 1993
Hannover, Germany

BioTechnica'93

Annette Benjamin, Secretariat, Deutsche Messe AG, Messegelände, D-W 3000 Hannover 82, Germany

26-28 October 1993
San Francisco, CA, USA

International biotechnology expo & conference (IBEX '93)

Conference Secretariat, BioExpo Management Office, 1070 Sixth Avenue, #307 Belmont, CA 94002, USA

3-4 November 1993
Baltimore, MD, USA

Ethics and politics related to clinical trials

Johns Hopkins Medical Institutions, Office of Continuing Education, Turner Building, 720 Rutland Avenue, Baltimore, MD 21205, USA. Tel: (1-410) 955-2959

10-13 November 1993
Montpellier, France

9th international medical and pharmaceutical research & technology meeting: Euromedicine 93

General Organization/Press Service, SN. Editel, 76 Rue Bonaparte, 75006 Paris, France. Tel: (33.1) 43-54-30-99; Fax: (33.1) 43-54-85-91

13-17 December 1993
London, UK

Liposomes in drug delivery: the nineties and beyond

Conference Secretariat, Centre for Drug Delivery Research, The School of Pharmacy, London University, 29-31 Brunswick Square, London WC1N 1AX, UK. Tel: (44-71)753-5822; Fax: (44-71) 728-0622

12-17 June 1994
Barcelona, Spain

12th European immunology meeting (EFIS)

Immunology Department, Hospital Clinic, Villaroel 170, 08036 Barcelona, Spain. Tel: (34-3) 454-4920; Fax: (34-3) 451-8038

4-6 July 1994
Brighton, UK

Biotechnology '94

Conferences & Courses Dept, IChemE, 165-171 Railway Terrace, Rugby, Warwickshire CV21 3HQ, UK

17-20 November 1994
Monte Carlo, Monaco

Advances in gene technology: molecular biology and human disease

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PICTURE POSTSCRIPT

Cam/Len Sirman

Sunset silhouette in Jamaica

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