

## CHAPTER 10

# THE INTENSIFIED SMALLPOX ERADICATION PROGRAMME, 1967-1980

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## INTRODUCTION

The prevention and ultimately the eradication of smallpox constituted, in principle, one of the simplest and most straightforward of disease control activities. Effective long-term protection was provided by the single application of a vaccine which was easy to administer and highly stable even under tropical conditions. The presence of smallpox in an area could be readily detected because of the characteristic rash it produced, a rash which was readily identifiable by programme staff and villagers alike. Only patients with rash transmitted the infection to others, and then only to persons with whom they were in close contact. Because 10–14 days elapsed between each generation of cases, smallpox usually did not spread rapidly and epidemics took time to develop. Little more was required to control its spread than the isolation of the patient and the vaccination of his close contacts.

Despite the simplicity of both smallpox control and the strategy for its eradication, implementation of practical field programmes over a finite time span and on a global scale was a complex and difficult task. The achievement of eradication and its certification

ultimately required the cooperation of all countries. The participation of an international agency—the World Health Organization—was important, and probably essential, in ensuring such cooperation. As the international organization with technical responsibility for health programmes, WHO was requested by resolution WHA20.15 of the Twentieth World Health Assembly “to elaborate and implement the detailed plan, including the co-ordination of all international, bilateral and national efforts” for the Intensified Smallpox Eradication Programme (World Health Organization, 1973a). In carrying this out, however, WHO had no authority, other than that of moral suasion, to compel any country to initiate a programme, adhere to a plan or strategy, or contribute towards its support. For this reason, the global programme had to evolve within a framework of broad principles and expectations, pragmatically modified by reality, rather than within the confines of a comprehensive master plan having specific and enforceable time-limited goals.

In November 1967 the entire professional and secretarial staff of WHO throughout the world (including short-term consultants and

WHO agents in Zaire) numbered only 3302 persons, few indeed to cope with the array of tasks and responsibilities with which the Organization had been charged by the World Health Assembly, its governing body. Those assigned to smallpox eradication were likewise few in number, the staff of professional grade in no year comprising more than 150 persons (including consultants), of whom no more than 6 were in Headquarters and, at most, 7 in the WHO regional offices. They were expected to promote special programmes in more than 50 countries and to guide and coordinate activities which, at times, involved as many as 150 000 workers.

The programme presented unusual challenges for WHO, because the administrative structure and procedures of the Organization were primarily designed for the purpose of providing technical assistance, rather than material support, to a wide range of health projects in many different countries, few of which needed to be coordinated with others. Smallpox eradication, in contrast, required the provision of substantial material support and far closer collaboration among countries and among largely independent WHO regional offices, both in programme execution and in resource allocation.

The Director-General, Dr Marcolino Candau, had foreseen the need to mobilize substantial voluntary contributions in support of the programme but, in 1967, the Organization had had only limited experience and little success in obtaining contributions of this type. Significant donations for smallpox eradication—apart from some bilateral contributions—did not begin to be received by WHO until more than 7 years had elapsed. The consequent lack of resources constituted a serious, continuing problem and, even in the concluding years of the programme, those that were made available barely sufficed to sustain momentum. Donated vaccine, for example, was continually in short supply despite repeated appeals for assistance. The World Health Assembly was informed on a number of occasions of the need for additional funds, amounting to no more than a few million US dollars, and such funds were sought in correspondence and in meetings with potential donors, but the response was never adequate. Expenditures for smallpox eradication from WHO's own regular budget, measured in constant dollars, seldom exceeded US\$2.4 million annually, the amount initially appropriated by the Nine-

teenth World Health Assembly in 1966. Thus, restraint and compromise in field operations were necessary even when global eradication appeared imminent. Success was never a certainty even during the years immediately preceding the last known cases.

The problems of sustaining international commitment and support were formidable but no less so than those in many of the countries with endemic smallpox. Successful national programmes required a political commitment to undertake eradication, but smallpox was not a concern of high priority for some countries, even though they might have voted for World Health Assembly resolutions in favour of its eradication. Sustaining a commitment to the programme was no less difficult because, in many countries, governments changed frequently, as did the responsible health officials, and such changes led to the readjustment of national priorities. Famine, flood, epidemic cholera and the like often diverted smallpox eradication programme resources for long periods; civil war in Ethiopia, Nigeria, Pakistan and Uganda caused serious disruptions in operations; and collaboration with several governments in southern Africa, as well as some in Asia, was all but impossible owing to political constraints.

After smallpox had been eradicated, however, many persons inside and outside WHO mistakenly concluded that the achievement could be attributed to a generously financed, enthusiastically supported and authoritatively directed programme similar to a military campaign. That the programme had none of these characteristics is apparent from this and the succeeding chapters.

This chapter describes the context within which the programme functioned in WHO and how the overall campaign developed and matured, how national programmes were established, how international coordination was achieved, how personnel were recruited and budgetary problems resolved, how supplies of vaccine were obtained and handled, and how research contributed to the effort. All these activities were interrelated, and critical constraints or important developments in one area affected progress in others. For clarity of presentation, different elements of the Intensified Programme are discussed individually, beginning with the overall strategic plan and the programme's administrative structure, relationships and personnel at the international level. This is followed by a

description of the way in which national governments became committed to the programme. A discussion of resources, surveillance and research, from an international perspective, is followed by a general description of the approaches adopted and results obtained in national programmes of vaccination and surveillance. To provide an overall perspective and an introduction to the chapters describing national programmes (Chapters 12–23) and certification activities (Chapters 24–27), a brief chronological summary of events concludes the chapter.

### THE STRATEGIC PLAN

As described in the Director-General's report on smallpox eradication to the Nineteenth World Health Assembly (World Health Organization, 1966b), the strategic plan for eradication during the Intensified Programme was 2-pronged: (1) mass vaccination campaigns in which freeze-dried vaccine of assured quality was employed and which were assessed by special teams, and (2) the development of a surveillance system for the detection and investigation of cases and the containment of outbreaks. In the execution of the programme, 3 principles were considered to be of special importance: (1) all countries would need to participate and their efforts would require regional and global coordination; (2) flexibility and adaptability would be required in the implementation of national programmes; and (3) ongoing research, both in the field and in the laboratory, would be needed to evaluate progress, define alternative directions and methods, and solve problems as they arose.

To foster a common understanding of principles and procedures among a geographically far-flung programme staff, a comprehensive mimeographed manual entitled *Handbook for Smallpox Eradication Programmes in Endemic Areas*, hereafter referred to as the WHO Handbook, was issued by the Organization in July 1967 (SE/67.5 Rev. 1, World Health Organization). It was an elaboration and adaptation of a manual developed in 1966 for the programme supported by the USA in western and central Africa (see Chapter 17). The foreword to the WHO Handbook encouraged programme staff to innovate and to adapt as needed, since programmes should

evolve and change with experience. For this reason, the WHO Handbook was deliberately referred to as a "draft", in the expectation that revised versions would be prepared in subsequent years on the basis of field experience. Because of the small number of staff available in Geneva and the speed with which the programme developed, no revised version was ever issued, other means being used for passing on from one country to another new and important observations and approaches. The WHO Handbook included a wide variety of information, ranging from an account of the clinical features of smallpox and the methods used in laboratory diagnosis to a description of operational approaches for vaccination campaigns and surveillance programmes; it also described methods for use in health education, and the management of administrative and transport services. The Handbook concluded with a section describing more than 20 subjects of interest for field and laboratory research.

The basic strategy, with certain modifications in emphasis and subsequent elaboration of methods for its implementation, withstood the test of field experience. Vaccination campaigns, however conducted, were expected to reach at least 80% of the population in all areas, and higher, but unspecified, rates of coverage in the more densely populated cities and towns. The figure of 80% was not based on any epidemiological criterion, but represented what was believed to be an achievable goal in a well-conducted programme. As an indicator of the use of potent vaccine, the plan called for a take rate of at least 95% for primary vaccinations. To determine whether these objectives were being met in a given area, independent assessment teams were expected to monitor the results in a sample of the population soon after the campaign had concluded in that area.

Although assessments of coverage and take rates were considered to be important quality control measures in the vaccination campaigns, the WHO Handbook emphasized that "the success of the programme, therefore, is appraised ultimately by the occurrence or absence of endemic smallpox and the *principal assessment technique, accordingly, is surveillance*". Surveillance was to be based on a reporting system in which all existing medical and health units participated. This was to be supplemented by the immediate investigation of reported cases and a critical review of outbreaks to determine how and why small-

pox was being spread. The WHO Handbook stated that:

"... surveillance thus is an essential component of the programme since the term 'eradication' implies that the number of indigenous cases of smallpox is '0'. However extensive a country's vaccination campaign, however accurately assessed, a country with an inadequate system for surveillance cannot determine whether ... eradication has been achieved."

Since it was recognized that surveillance was a new concept and might be difficult to implement in highly endemic countries, a phased programme for its development was proposed (see Chapter 17, Table 17.4).

Mass vaccination was a familiar and readily acceptable concept to public health officials. Assessment of the quality of work and of progress, on the other hand, had not been common practice. Few were accustomed to measuring the success of their efforts and many, in fact, had never questioned whether the vaccine in use was satisfactory or had been properly stored. Both assessment and surveillance proved difficult to incorporate into most programmes.

### THE WORLD HEALTH ORGANIZATION

Among the international agencies, WHO has played a pre-eminent role and acquired substantial experience in providing technical assistance and cooperation for health programmes and in the development of international health policies. Other international agencies—e.g., UNICEF and the United Nations Development Programme—have provided substantial material assistance for health programmes, but WHO, from the time of its foundation, has seen its main task as that of providing technical guidance (Finkle & Crane, 1976). WHO, like all large administrations, has gradually evolved its own patterns and traditions of management and, while a full exposition of this subject is beyond the scope of this book, certain features are important to an understanding of the course of development of the global smallpox eradication programme.

In a comparative analysis of 8 major international organizations, Jacobson (1973) characterized the role of the Director-General of WHO as being unusually significant and influential. He described the Organi-

zation as a "strong and stable system", but noted that it was "dominated by the ideology of medicine" and "by a strong commitment to regionally decentralized service activities". Because of this decentralization of activities and responsibility within WHO, its regional directors have also played unusually important roles. They and the Director-General are the only elected officials of the Organization. If after a term of office of 4-5 years they wish to be reappointed, they must stand for re-election by Member States. The factor of re-election inevitably has a bearing on their decisions regarding the recommendation of projects, budgetary allocations to countries, appointment of staff by nationality, and other matters. Continuity of the elected leadership, however, has been the norm. Although the first Director-General, Dr Brock Chisholm, served for only 5 years (1948-1953), his successor, Dr Marcolino Candau, served for 20 years (1953-1973), and Dr Halfdan Mahler has held the office since that time. For most regional directors, a long term of office has likewise been the norm.

### The Members and Governing Bodies of WHO

The World Health Assembly, which decides WHO's policies and programmes, consists of delegates representing Member States, each Member State having one vote. It normally meets once a year, usually in May. Guidance to the Health Assembly is provided by the Executive Board, a smaller body, whose members serve in a personal rather than an official capacity but are designated by the governments of Member States elected by the Health Assembly. The Board meets twice a year, the main meeting being held in January, while a second, shorter, meeting takes place immediately after the Health Assembly.

The Twelfth World Health Assembly (1959) and the Nineteenth World Health Assembly (1966) committed WHO to the global eradication of smallpox although some countries were not then Members of the Organization and hence not party to these decisions. Among those which, in 1966, were not yet Members or were not yet directly represented were the People's Republic of China, the German Democratic Republic, the Democratic People's Republic of Korea and the Socialist Republic of Viet Nam. Until the 1970s, no official communication between

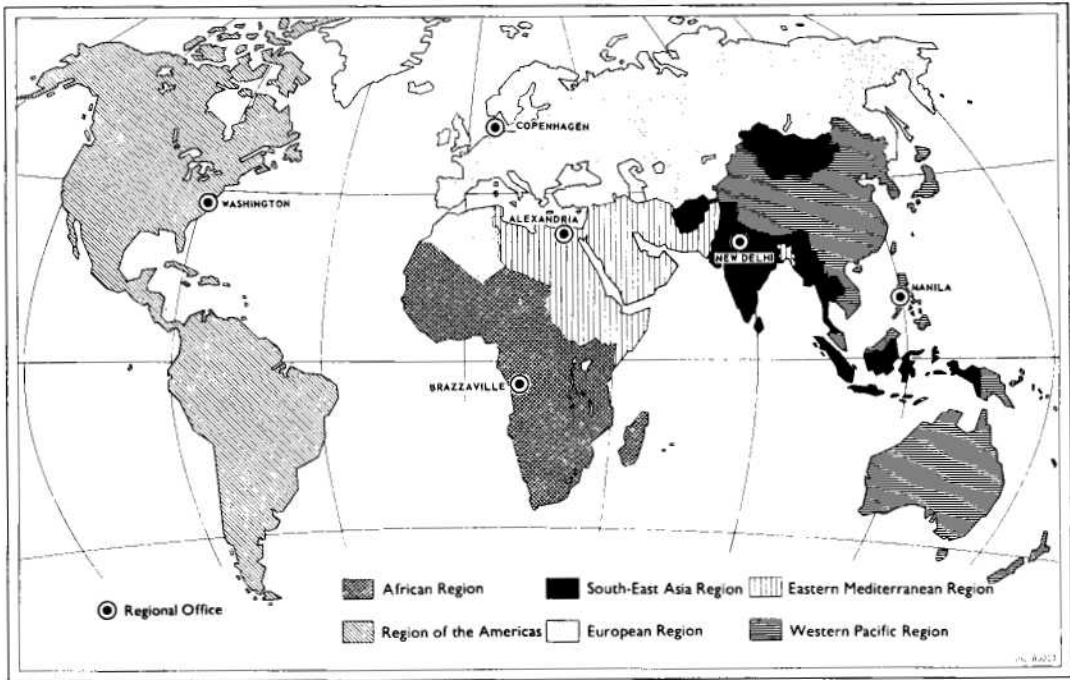


Fig. 10.1. WHO regional offices and the areas they served, December 1967. Whereas there were 167 Member States and Associate Members of WHO in December 1986, there were only 129 when this map was prepared (from World Health Organization, 1968a). A number of countries or territories shown here as served by WHO regional offices were not directly represented in WHO in 1967, the largest among them being the People's Republic of China.

WHO and these governments was possible and little official information was available from some of them about the status of smallpox in their countries. None was thought to have endemic smallpox in 1966, although it was not possible to confirm this until after they became Member States of the Organization. Besides these countries, there were 4 other large territories, all in Africa, which in 1966 either no longer participated in WHO (South Africa) or were represented by colonial powers (Angola, Mozambique, and Southern Rhodesia). All except Angola had endemic smallpox in 1967. Until the 1970s, however, it was difficult or impossible for WHO to communicate with these countries as well, either about the occurrence of smallpox or about the status of their programmes. Thus, effective universal participation in the smallpox eradication programme was not achieved until a number of years after the Intensified Programme had begun, and not until 1979 were communications adequate with all countries so that global eradication could be certified.

Each Member State is attached to one of WHO's 6 regions (Fig. 10.1), only 4 of which had endemic smallpox in 1967—Africa, the Americas, South-East Asia and the Eastern Mediterranean. Regional committees, at which Member States of the respective regions are represented, meet once a year to decide regional policy and to examine the regional director's proposed programme budget for transmission to the Director-General and inclusion in the Organization's global programme budget.

The type of representatives sent by Member States to the Health Assembly and the regional committees had a bearing on the smallpox eradication programme and on the outcome of resolutions. An analysis of delegates to the Twentieth World Health Assembly (1967) showed that 80% were representatives of health ministries (Jacobson, 1973); while that was logical and often advantageous, it was sometimes a handicap to obtaining voluntary contributions from governments and to securing national commitment to undertake eradication programmes. Volun-

tary contributions from the industrialized countries were usually provided by a development agency separate from the ministry of health and, as experience showed, liaison between the two was frequently deficient. Programme policies and needs identified by the World Health Assembly were often not understood by the development agencies and sometimes, because of this, appeals for voluntary contributions went unheeded. The way that the countries with endemic smallpox were represented also gave rise to problems. Ministries of health, to which most delegates belonged, were often politically weak, the minister often not being of cabinet rank. Decisions with regard to the allocation of national resources were often made elsewhere in government—e.g., in planning departments, few of whose members attended the World Health Assembly. Thus, the commitment of some Health Assembly delegates to undertake national programmes meant little from the point of view of their implementation.

### Role of the Director-General

Decisions on policy and budgetary allocations were ultimately the responsibility of the Health Assembly, acting on the advice of the Executive Board but, as Jacobson (1973) points out:

“The Director-General initiates the process of formulating WHO’s budget and establishes guidelines . . . Later he compiles the proposals of the headquarters staff and the regional offices. At both stages he has opportunities to make important judgments about allocations among functions and regions. The formal position of the Director-General makes him an initiator, controller and vetoer as far as programmatic decisions are concerned.”

The minutely detailed budgets proposed by the Director-General were seldom altered either by the Board or by the Health Assembly; moreover, after they had been approved, he had considerable discretionary authority to transfer funds from one programme to another and from country to country as need and opportunity dictated.

Changes in WHO policies were less likely to be impeded by long-established career staff than in many other large administrations. Relatively few had career service appointments in comparison with some other international organizations. From the time of

WHO’s foundation, a continuing turnover of personnel had been considered helpful in sustaining a high level of professional expertise. Thus, in 1969, only 20% of professional staff at Headquarters and the regional offices and about 5% of those working in field projects had career service appointments (Jacobson, 1973). In the same year, only 29% of the staff had served in WHO for more than 5 years.

For these reasons, WHO’s limited financial support for smallpox eradication prior to 1967 (see Chapter 9) reflected the concerns and priorities of the Director-General at least as much as those of the Health Assembly. His attitude in turn reflected, in large measure, his scepticism as to the possibility of achieving global smallpox eradication until basic health services in all countries had been greatly strengthened, a scepticism shared by many scientists and health officials at that time. His doubts had been reinforced by the recommendation of the WHO Expert Committee on Smallpox (1964), discussed in the preceding chapter, which implied that everyone would have to be vaccinated to ensure eradication. Since, for example, there were tribes in the Amazon basin with which national authorities had little or no contact, it was apparent that universal vaccination was not then possible. For the Organization to be committed to an unattainable objective when, at the same time, its only other global eradication programme—that for malaria—was in serious difficulty, could jeopardize WHO’s technical credibility. Moreover, the Director-General foresaw the possibility of another single-purpose eradication programme diverting national and international resources and attention from the important, but difficult and less glamorous, task of developing basic health services. He frequently pointed out that, if additional funds were to be allocated to smallpox control, they should be provided in the form of voluntary contributions by the industrialized countries, which would benefit by having fewer imported cases of the disease to deal with.

The decision, in 1966, by the Nineteenth World Health Assembly to establish a special allocation for smallpox eradication in the Organization’s regular budget required WHO to undertake a more vigorous programme, but the additional funds did not allay the Director-General’s concerns about the Intensified Programme’s prospects of success.

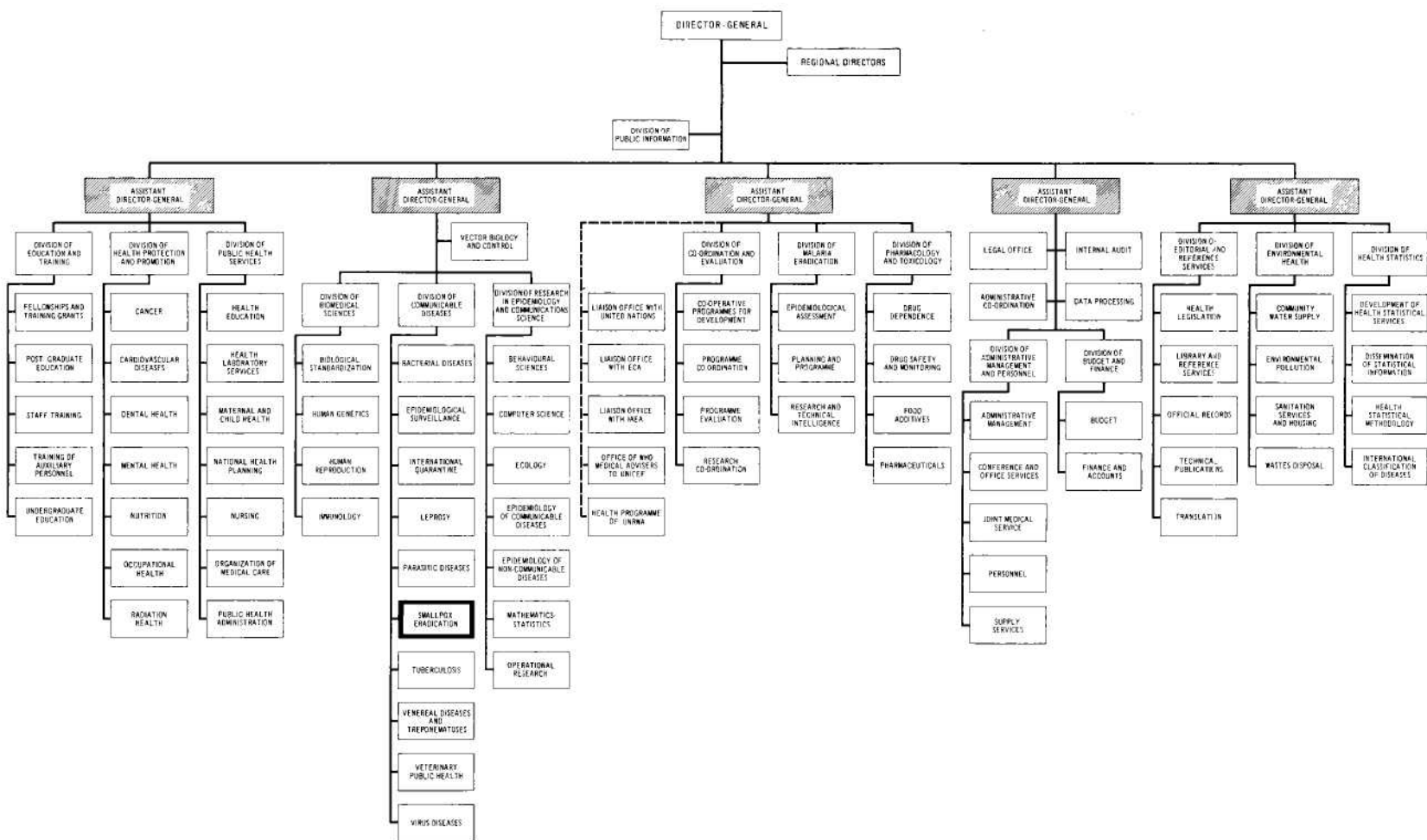


Fig. 10.2. Organizational structure of WHO Headquarters, December 1967.





**Plate 10.1.** Halfdan T. Mahler (b. 1923) took office as Director-General of WHO in July 1973. His long career in international public health had included almost 10 years as a senior WHO officer with the Indian national tuberculosis programme. This involved the application of methods of operations research that proved valuable when, as Chief of the WHO Tuberculosis unit, 1962–1969, he worked with the Smallpox Eradication unit to overcome the problems of the simultaneous administration of BCG and smallpox vaccines. He had been an Assistant Director-General of WHO from 1970.

### WHO Programme Management in Geneva

The management and supervision of technical programmes at WHO Headquarters differed from what an organizational chart (Fig. 10.2) might suggest, as is indeed the case with many organizations. During Dr Candau's term of office as Director-General, technical programmes at WHO Headquarters were usually monitored by the Director-General and the Deputy Director-General, Dr Pierre Dorolle, through direct contact with the chiefs of the respective technical units. The senior intermediate positions in this inter-governmental organization—assistant directors-general and directors of divisions—had many representational duties and were often relatively little concerned with the day-to-day activities of the technical units. Over the 20-year period during which Dr Candau was Director-General, the Organization grew in size and the number of activities and technical units multiplied,

making direct supervision of each of them increasingly difficult. Smallpox eradication programme staff seldom met the Director-General until Dr Halfdan Mahler assumed the post in 1973. Contacts with the responsible assistant director-general were likewise uncommon before Ladnyi's appointment to this position in 1976. Among those who served as directors of the Division of Communicable Diseases, Dr Karel Raška, who held this post until early 1970, took a particular interest in smallpox eradication and actively supported the programme.

The Smallpox Eradication unit had, of necessity, a closer, continuing relationship with those responsible for WHO's administration and finance. Until 1971, the Assistant Director-General responsible for this area, Mr Milton P. Siegel, an active proponent of smallpox eradication, directed these activities and those reporting to him took a similar interest in the programme. Both during and after his period of tenure, most of them went out of their way to provide help and guidance.

Throughout much of the smallpox eradication programme, the unit, as far as the management of its technical activities was concerned, functioned relatively autonomously. This meant that it could alter smallpox programme policies and make other decisions quickly, but it made it more



**Plate 10.2.** Milton P. Siegel (b. 1911), Assistant Director-General of WHO responsible for administrative and financial matters, 1947–1971.



**Plate 10.3.** Administrative staff at WHO Headquarters who played an especially important part in supporting the smallpox eradication programme. **A:** Adriano M. Imbruglia (b. 1925), Chief, Budget, 1971–1984. **B:** Irwin T. Brooks (b. 1916), Chief, Supply Services, 1968–1977. **C:** Alistair J. S. Taylor (b. 1923), Chief, Administration and Finance, WHO Regional Office for South-East Asia, 1972–1975; then Chief, Personnel, 1975–1983. **D:** John F. Carney (b. 1920), Chief, Finance and Accounts, 1972–1980.

difficult to implement the necessary changes and to persuade regional directors, government officials and donor agencies of the programme's need for support.

### The Smallpox Eradication Unit in Geneva

The Smallpox Eradication unit in Geneva consisted throughout most of the programme of only 10 persons—4 medical officers, 1 administrative officer, 1 technical officer and 4 secretaries. Even this number had originally been considered excessive by senior WHO staff, who then envisaged the unit's activities as consisting of little more than ensuring that each country received adequate resources for conducting mass vaccination campaigns (see Chapter 9). During the first year of the Intensified Programme, however, it became apparent that far more than this was required and, indeed, that additional personnel would be useful. However, requests for additional staff were rejected, in part because of pressures by WHO Member States to limit the size of Headquarters staff. But short-term consultants could be recruited, and in 1968-1969, Dr Gordon Meiklejohn served on the staff during a sabbatical year's leave from the University of Colorado; in 1969-1970, Dr

Paul Wehrle, on similar leave from the University of Southern California, also worked in the unit. Every year subsequently, each undertook special tasks on behalf of WHO for 4-6 weeks during his university vacation.

Some compensation for the dearth of staff was provided by the fact that many of those in the Headquarters Smallpox Eradication unit served for long periods; this ensured continuity and consequently a greater ability to anticipate the problems of the Organization and of governments in the endemic countries (see Table 10.1).

Late in 1970, an interregional team of 3 additional medical officers was authorized to provide short-term emergency assistance wherever required and to help in establishing surveillance programmes where these were lacking. One was recruited and assigned to Ethiopia, in which that greatly understaffed programme was just beginning, and 2 to West Pakistan when that region was divided into 4 provinces with 4 essentially autonomous smallpox programmes (see Chapter 14). As their presence in these assignments continued to be necessary, they were effectively lost to the Headquarters complement, though remaining chargeable to the Headquarters budget since the Regional Office for the

Table 10.1. Length of service and relevant previous experience of the professional staff of the Smallpox Eradication unit at WHO Headquarters, 1966-1987

Name	Position	Period	Previous experience
Dr D. A. Henderson	Chief Medical Officer	1966-1977	
Dr Isao Arita	Medical Officer	1965-1977	WHO adviser in Liberia, 1963-1965
	Chief Medical Officer	1977-1985	
Dr Zdeněk Ježek	Medical Officer	1980-1985	WHO Smallpox Eradication and Epidemiological Advisory Team, South-East Asia Region, 1972-1977; WHO adviser in Somalia, 1977-1979
	Chief Medical Officer	1985-1987	
Dr Ehsan Shafa	Medical Officer	1971-1977	WHO Regional Adviser on Smallpox Eradication, Eastern Mediterranean Region, 1967-1971
Dr Stephen Falkland	Medical Officer	1966-1969	
Dr Georgij Nikolaevskij	Medical Officer	1967-1971	
Dr Anatolij Slepushkin	Medical Officer	1971-1976	
Dr Joel Breman	Medical Officer	1977-1980	AID adviser in Guinea, 1968-1970
Dr Alexander Gromyko	Medical Officer	1977-1983	WHO short-term consultant in India, 1974
Dr Lev Khodakevich	Medical Officer	1983-1986	WHO adviser in India, 1973-1977, and in Ethiopia, 1978-1979
Mr John Copland	Administrative Officer	1966-1977	
Miss Ija Jurjevskis	Technical Officer	1967-1969	
Mrs Linda Licker	Technical Officer	1969-1970	
Mr John Wickett	Technical Officer	1970-1977	
	Administrative Officer	1977-1979	
	Consultant	1983-1987	
Mr Robert Evans	Technical Officer	1978-1979	AID adviser in Nigeria, 1968-1970
	Administrative Officer	1980	
Mr James Magee	Public Information Officer	1978-1980	

Eastern Mediterranean stated that it had no funds with which to take them over. Other efforts to increase the size of the Headquarters Smallpox Eradication unit were unsuccessful. In consequence, the few professional staff based in Geneva of necessity undertook a wide range of activities both at Headquarters and in the field. As the programme progressed, they had to travel more and more, to the point that most were in travel status for 50–70% of the time.

A partial listing of the activities undertaken by the unit gives some insight into the nature of day-to-day operations. In the interests of the morale of field staff and the acceleration of operations, priority was given to all communications from the field, the aim being to respond to queries or requests within 48 hours of receipt. A surveillance report was prepared for publication every 2–3 weeks in the *Weekly epidemiological record* and more extensive summary reports on the programme twice a year. Voluntary contributions were repeatedly sought through special mailings and visits to governments and other potential donors. Arrangements were made for the testing of vaccine and for its shipment to a central depot in Geneva. Stocks of

vaccine, bifurcated needles, jet injectors, kits for the collection and dispatch of specimens and training aids were kept in Geneva and sent on request, to countries. Specimens from patients were received weekly from different countries, repacked and sent to reference laboratories for testing; the results were sent by telex to those submitting the specimens (see box). Each year 1–2 international meetings were arranged for senior smallpox eradication programme staff from regional groups of endemic countries, as well as annual conferences of WHO's regional smallpox advisers, biennial meetings of the research group concerned with monkeypox and related problems, meetings of the WHO Expert Committee and the WHO Scientific Group on Smallpox Eradication, and a special meeting dealing with vaccine production. Various training and educational instruments were prepared—manuals, posters, slide series, teaching exercises and films. An extensive correspondence was conducted on the recruitment of personnel, regional and national budgets and programmes, and the procurement of supplies and equipment. Press releases were prepared and media queries answered. Reports from field staff dealing with their work and observations were edited and published twice a month.

Because of the heavy travel commitments of the unit's staff, there was insufficient time to perform all these functions well. Had there been adequate manpower, the following 3 activities, in particular, could usefully have received more attention and this, almost certainly, would have reduced the time required to achieve eradication: (1) field studies to define more precisely the status and epidemiology of smallpox in different areas and to evaluate alternative methods of smallpox control; (2) field demonstrations, extending over 2–3 months, of surveillance–containment methods; and (3) personal contacts with potential donors to explain the programme and to seek support.

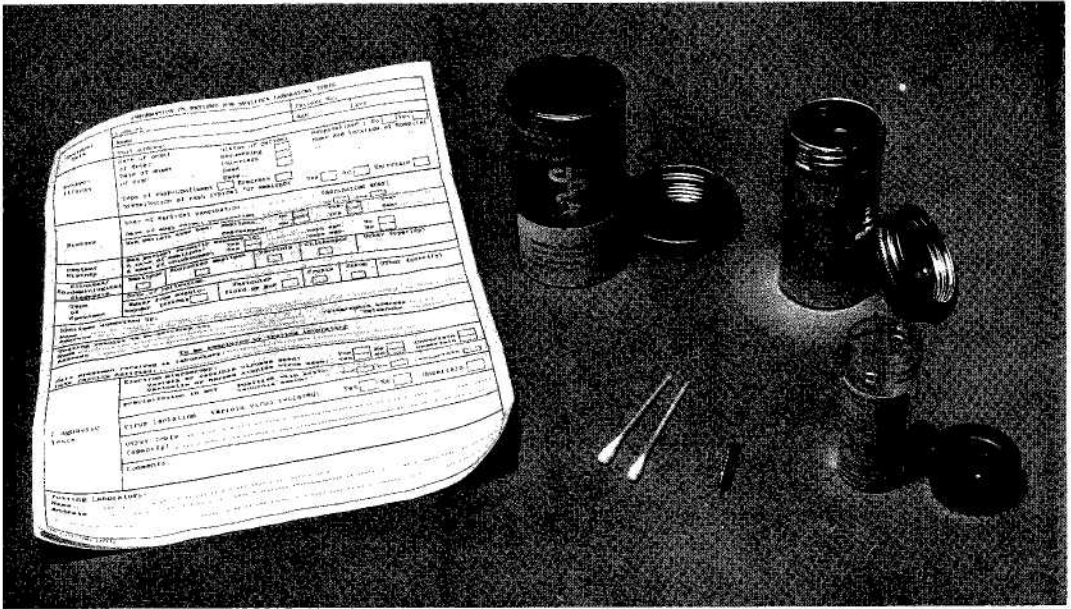
The Smallpox Eradication unit had comparatively few collaborative relationships with other technical units at WHO. One other unit with which it worked closely was that responsible for implementing the provisions of the International Health Regulations. This unit received weekly telegraphic reports of cases of the quarantinable diseases, including smallpox, and published them in the *Weekly epidemiological record*. These activities are described below, in the section



**Plate 10.4.** Participants in the meeting of the WHO Expert Committee on Smallpox Eradication in November 1971. The chairman (right) was Francis C. Grant (b. 1924) of the Ministry of Health of Ghana, who had been a smallpox eradication consultant for WHO in Burma in 1970. The rapporteur was Paul F. Wehrle (b. 1921), a United States professor of paediatrics who had helped to establish the global eradication programme while serving as a WHO consultant in Geneva, 1969–1970.



**Plate 10.5.** Staff of the Smallpox Eradication unit at WHO Headquarters. **A:** Donald Ainslie Henderson (b. 1928), Chief, 1966–1977. **B:** Isao Arita (b. 1926), Medical Officer, 1965–1976; then Chief, 1977–1985. **C:** John S. Copland (b. 1930), Administrative Officer, 1967–1977. **D:** John F. Wickett (b. 1944), Technical Officer, then Administrative Officer, 1970–1980, and consultant, 1983–1987. **E:** Susan E. Woolnough (b. 1948), secretary to Henderson and Arita, 1970–1985. **F:** Celia I. Sands (b. 1945), secretary, 1969–1981.



**Plate 10.6.** Kit provided by WHO for the collection and dispatch of virological specimens.

entitled "Surveillance and notification of smallpox cases". Collaboration with such units as those dealing with health education and maternal and child health would have been logical and potentially productive but most of them were small, with only 2 or 3 professional staff, few of whom were directly concerned with field operations. The only programme of substantial size and with extensive field activities was that for malaria eradication, but by the mid-1960s it had begun to encounter major problems which fully occupied its staff. The only other immunization programme, until 1975, was that for tuberculosis, which was the responsibility of the Tuberculosis unit. However, the staff of that unit were also few in number and much of their time was devoted to field trials aimed at assessing the efficacy of BCG vaccination.

### WHO Regional Offices

The WHO regional offices were positioned administratively between WHO Headquarters and countries and were expected to play a major role in the development and coordination of all types of country programmes in their respective regions. For them, the Intensified Smallpox Eradication Programme differed from others for which they were responsible in that it required more or

less simultaneous activities in all countries, both to monitor the occurrence of smallpox and to undertake programmes to eradicate the disease or to detect and contain importations. Its needs were different, therefore, from those of tuberculosis control or maternal and child health, for example. Programmes such as these were often country-specific, and it was usually of little moment to the region as a whole or to other countries whether one or more countries did or did not undertake special activities or whether a given disease was widely prevalent elsewhere or not. It might seem that experience acquired in malaria eradication would provide a model, but it did not. National malaria eradication programmes had been implemented with WHO assistance in South America and Asia but in only one country of sub-Saharan Africa (Ethiopia). Most of the smallpox-affected countries that also had endemic malaria had not progressed beyond the "attack phase", in which systematic spraying was the primary activity. Even where there was surveillance it tended to be purely national in character, since knowledge of the malaria status of neighbouring countries was of little interest except in certain border areas.

Most WHO regional offices did not, at that time, initiate health programmes. Rather, they responded to requests for assistance from governments. Owing to budgetary constraints, the travel of regional office staff

### Processing of Specimens from Suspected Smallpox Patients

Specimens from suspected smallpox patients from all parts of the world were sent to Geneva and, once a week, sent by air, alternately to the WHO collaborating centres in Atlanta (Center for Disease Control) and Moscow (Moscow Research Institute for Viral Preparations). This practice was followed so as not to overburden either laboratory. Most specimens were received in Geneva in collection kits designed and provided by WHO (see Plate 10.6). The kit included a stylette and swabs for taking specimens, and a screw-capped glass vial into which the specimen was to be placed and which, in turn, fitted into a screw-capped metal container. Two copies of a form providing identifying information about the patient were wrapped around this second container and the contents placed in yet a third screw-capped cardboard shipping container. When received in Geneva, only the outer container was opened, one copy of the form removed and the specimen logged in. Laboratory results were sent to Geneva from the laboratory by telex or telephone and relayed, in turn, to the responsible health administration.

Although no problems arose with this method of handling specimens in Geneva, it is seen, in retrospect, to have been less than satisfactory, since it assumed that neither the form nor the second container was contaminated with variola virus and thus capable of causing infection. However, health officials in some countries sent specimens in other types of containers, including envelopes and small boxes, which were sometimes only partially sealed. Miss Sands, who dealt with the specimens, was revaccinated every year, as were all the staff, but she opened and processed the specimens at an ordinary secretary's desk in an open room.

While unthinkable now, the system, at the time, appeared to provide reasonable safeguards against the chance infection of others in Geneva. The infection of personnel handling specimens, even in laboratories, was uncommon and, until the mid-1970s, laboratory precautions consisted in little more than the vaccination of personnel. The occurrence of smallpox in 1978 in Birmingham, England, in a person exposed to virus carried by an air duct from one room in a laboratory to another demonstrated the need for more stringent precautions.

Another concern present throughout the course of the programme was that of the possible loss of specimens in shipment. Thanks to a rigorous, continuing check of bills of lading against receipt of shipments, this did not occur, but, as a precaution, specimens sent from Geneva to Moscow and Atlanta were packed in large containers which would be less likely to be mislaid.

tended to be restricted. Efforts to persuade WHO regional directors that the needs of global smallpox eradication called for a somewhat different approach met with only limited success, varying from region to region. The Region of the Americas and the Eastern Mediterranean Region immediately appointed full-time advisers on smallpox eradication, and a year afterwards two medical officers in the South-East Asia Region were given full-time responsibility for smallpox eradication. In these regions, programme planning, the recruitment of staff and the procurement of supplies and equipment were most efficiently conducted. In the African Region, however, until certification activities began, responsibilities for the smallpox eradication programme were assigned as

a part-time responsibility to the adviser on tuberculosis or on all communicable diseases. Not only did this region include more countries than any other, with some of the world's least developed health systems but, in addition, communications between the regional office and countries were poor and travel was difficult. As is described in the chapters dealing with field operations, there were continuing problems of every type in endeavouring to develop and support national programmes. In all regions, however, a lack of personnel in the regional offices and the customary constraints on their travel handicapped programme development. Where only a single adviser was involved, his absence on leave or duty travel meant that communications often went unheeded and

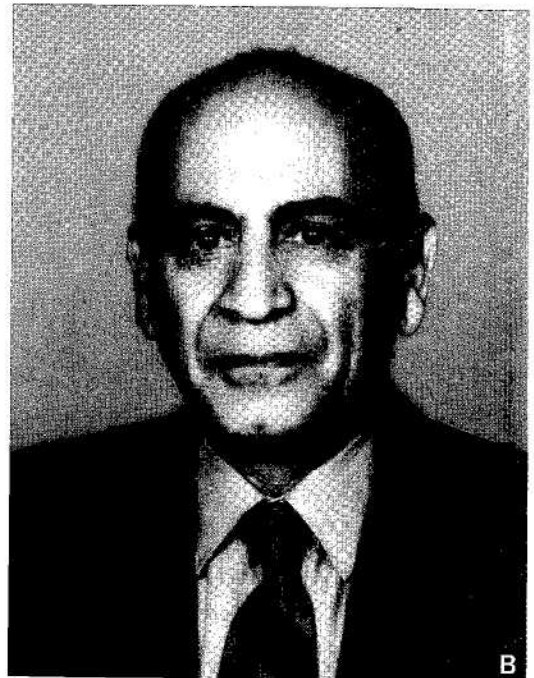
other activities, such as recruitment and the procurement of supplies and equipment, slowed down or ceased altogether. As a result, Headquarters staff travelled far more frequently and extensively than might otherwise have been necessary for a programme having a regional structure.

The regional offices were at that time likewise largely unaccustomed to the coordination of plans, needs and resources within a global context. To try to achieve better coordination, the Headquarters Smallpox Eradication unit held annual meetings for those responsible for smallpox eradication in each region to discuss goals, plans and progress. At the meetings, priorities were decided and needs identified, including funds, vaccine, vaccination instruments, personnel, and training aids. Such meetings were usually held in conjunction with a WHO-organized multinational meeting of programme staff, at which strategy and recent field observations were also discussed. Whatever the venue, it was always necessary to make a special appeal to one or several of the regional directors to obtain permission for advisers to attend, a permission which was

usually but not always granted and then only on the condition that Headquarters funds would be used for travel. Although the meetings proved invaluable, it was never possible to achieve a rational allocation of funds, as will be discussed later.

### WHO Representatives in Countries

The WHO representatives in countries provided the point of contact between WHO and the countries; they were assigned to most developing countries to assist in formulating policy and developing projects, and to provide administrative and technical guidance to WHO-supported programmes. Some of them had had many years of experience in international health work, but most were recent recruits who had held senior positions in their own national health services. They took up their positions after a short briefing, largely of an administrative character, and usually met their regional directors and other WHO representatives once or twice a year. Few were experienced or knowledgeable in smallpox eradication and, because of their



**Plate 10.7.** **A:** Nicole Christiane Grasset (b. 1927) served as adviser for smallpox eradication in the South-East Asia Region of WHO, 1970–1976, succeeding Jacobus Keja who had been an adviser there from 1967. **B:** Ahmad J. Hajian (b. 1920) was the smallpox eradication adviser in the Eastern Mediterranean Region of WHO, 1971–1977, replacing Ehsan Shafa (Plate 10.12).



numerous other responsibilities, few could make any substantial contribution specifically to the Intensified Programme.

### Smallpox Eradication Programme Staff

The quality and commitment of international staff proved to be one of the most important factors in the successful eradication of smallpox, and considerable time and effort were expended by the Smallpox Eradication unit on recruiting them. The task was not an easy one, however. Epidemiologists with experience in infectious disease control were particularly desirable because of the need to initiate and foster epidemiological surveillance. In 1967, however, few were available, and of those who were, almost none had ever seen cases of smallpox. Most were recruited on the strength of their experience in the management of health programmes, special consideration being given to basic competence and motivation. Specialized training in smallpox eradication methods would have equipped them better for their assignments but many difficulties were encountered in providing it. Thus, adequate numbers of fully qualified staff did not become available until the Intensified Programme was well advanced.

The provision of special training programmes in smallpox eradication proved impracticable, except for international and senior national staff working in the programme conducted with United States assistance in western and central Africa. For these, from 1966 onwards, the Communicable Disease Center (which has been renamed on several occasions and is now the Centers for Disease Control and widely known simply as CDC) provided a 4-week training course every year. Only a few WHO staff attended because WHO regional offices were unaccustomed to providing specialized training for newly recruited staff, as most were already experienced in the work that they were expected to do. In any event, by 1970, because of the early interruption of smallpox transmission in western and central Africa (see Chapter 17), the CDC course had so changed in character as to be of limited value for those engaged in the early phases of an eradication programme. WHO had provided specialized training at malaria eradication centres, but smallpox eradication was widely perceived as consisting in little more than mass vaccina-

tion, for which little specialized knowledge was thought to be needed. A WHO-conducted interregional training course was not available as an option because most regional offices did not wish to incur the expense of sending new advisers to Geneva for briefing. Most new staff therefore took up their positions with a briefing of a week or less in their respective regional offices, provided that there was a smallpox adviser in the region to brief them and that he was not then on duty travel. Not until 1974, when the number of international staff increased substantially, did WHO begin to provide organized training programmes for its staff. These were conducted at national level, first in India and then in Bangladesh and Somalia, concurrently with their large-scale intensified programmes.

Other methods were used to educate and orientate newly recruited staff. It was believed and subsequently confirmed that the clinical characteristics of smallpox could soon be learned after arrival in the country. For this purpose, the following were available: the WHO Handbook; a 4-colour, 8-page printed folder showing pictures of smallpox in African patients and describing the course of the disease (1969); sets of teaching slides showing smallpox in African patients (1969) and Asian patients (1971); and a large wall chart showing the appearance of smallpox and chickenpox rashes at various days after the onset of the disease (1970).

The epidemiological principles underlying proper surveillance and containment proved more difficult to convey. Many different approaches were used, beginning with the instructions provided in the WHO Handbook. Later, two case histories with syllabuses were developed, one dealing with techniques for the investigation and control of an outbreak (SE/71.1) and the other with surveillance-containment measures to be taken in an area with a population of about 2-3 million (SE/72.7). (The latter was adapted for use as a case history by the Harvard School of Business Administration.) On-site tutorial training was provided by WHO Headquarters and some regional smallpox eradication programme staff, and periodic intercountry meetings were structured to emphasize surveillance-containment methods and to illustrate approaches. Reports and materials distributed every 2-3 weeks in the so-called "biweekly mailing" (see below) also proved useful. All these efforts, however, fell short of what was required, as was shown by

the length of time required to implement surveillance-containment programmes in most areas and the fact that some African countries were never fully successful in doing so.

Difficulties in communicating with staff working in the field also hampered efforts to develop expertise and solve problems. All communications from Headquarters had to be routed through the appropriate regional office, logically the principal point of contact for the countries in that region. Where there was a full-time smallpox adviser and the region comprised few countries—South-East Asia, for example—reasonably close contact with field staff and programmes in the countries was possible. Where there was no full-time adviser and the countries in the region were numerous, as in Africa, communications were difficult and special measures were necessary. The nature of the problems may be illustrated by the fact that, if a letter was sent from Geneva to the regional office inquiring about the status and needs of a national programme, it was usually necessary for a regional adviser to prepare a special letter for the signature of one of his superiors or the regional director. After drafting and revision, the letter would then be sent to the WHO representative, who would contact either the WHO smallpox adviser or the national health authority. When the information had been obtained, a letter of reply would be prepared and the procedure repeated in reverse. Since the mail was slow and unreliable almost everywhere, it was exceptional to receive a reply to a query from Geneva in less than several months, if it was received at all.

This problem was overcome to some extent by arranging for copies of important correspondence and telex messages to be sent direct from a country to Geneva, and for Headquarters staff, likewise, to send a copy of the reply to the country, the original being sent to the regional office as prescribed. This was of crucial importance in many instances, for example, in dealing within days with an acute shortage of vaccine in Uganda at a time when a telex message "through the proper channels" took 8-9 weeks. Although this approach violated the prescribed procedures, field staff frequently noted that the immediate responsiveness of Headquarters staff to their requests and queries played an important role in sustaining morale and giving impetus to the programme.

Up to the end of 1967, WHO smallpox eradication programme staff throughout the world numbered less than 30. Additional WHO staff were required as national programmes began but recruitment proceeded slowly, the ability and dedication of recruits varying greatly. Except for those who were assigned to Geneva or were members of an interregional team, recruitment and selection were the responsibility of the regional offices, whose personnel services operated independently of Headquarters. Headquarters smallpox eradication staff endeavoured to assist the regional offices in identifying suitable candidates through personal contacts and the screening of applications received in Geneva, but proposals at first were as often ignored as accepted. An especially discouraging episode was the assignment by one regional office of a particularly well qualified candidate to an entirely different programme after months of work by Headquarters smallpox eradication staff to recruit him to WHO for work on smallpox eradication.

Because of the problems, such impetus as the programme possessed during its first few years was provided by a very small number of qualified WHO staff, the staff of the programme conducted with United States assistance in western and central Africa, and national staff. Among the WHO staff were Dr Pierre Ziegler, who worked in Zaire; Dr Celal Algan in Rwanda; Dr Karel Markvart in East Pakistan; Mr Henry Smith in Kenya; Mr Leo Morris in Brazil; Dr Jacobus Keja in the Regional Office for South-East Asia; and Dr Ehsan Shafa in the Regional Office for the Eastern Mediterranean. Eventually, however, a reasonably satisfactory collaborative relationship with respect to recruitment evolved between Headquarters and two of the four Regions concerned.

At first, many international staff were transferred from other projects which were not progressing well or in which the staff had proved unsuitable. Over a number of years, some of the less effective and less industrious staff were transferred by WHO to yet other programmes or did not have their contracts extended. A stated policy of the programme that all smallpox eradication staff should spend at least one-third of their time in the field facilitated this weeding-out process, the policy being monitored, where necessary, by review of daily tour diaries.

Especially helpful in the recruitment of more capable staff were senior epidemiolo-



## SMALLPOX KILLS!



**BE VACCINATED NOW**

Rp.5000.-  
Kanggo sing sepisanan nglapurake  
jen bener penjakit tjatjar



Lapurake marang pak Lurah  
utawa Mantri Kesehatan  
lan takokake apa sarat-sarate

**Plate 10.8. A:** A pictorial guide to the diagnosis of smallpox in African patients, published by WHO in 1969, which included pictures of patients with chickenpox for comparison. **B** and **C:** WHO issued posters with ample white space in which messages could be overprinted in local languages. The patient in **B** was photographed in Zaire, in **C** in Pakistan. The reward poster, **C**, overprinted in Indonesia, says: "5000 rupiahs to the first person who discovers a real case of smallpox. Please report to the head of the community or the local health inspector and ask about the terms."

# SMALLPOX

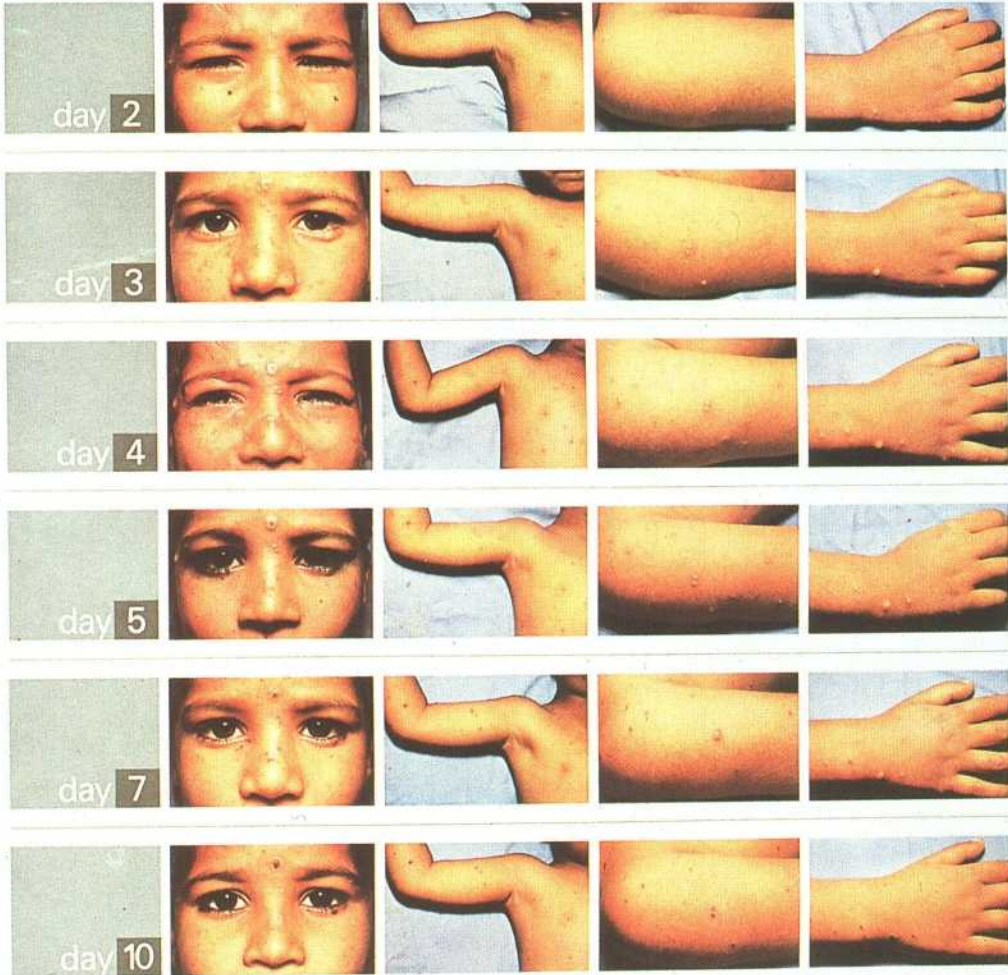
Stages  
of rash




**Plate 10.9.** The left-hand portion of a large wall poster that contrasted the rashes of smallpox and of chickenpox on 4 areas of the body. English, French and Portuguese versions of this poster were prepared in 1970.

# CHICKENPOX

Stages of rash

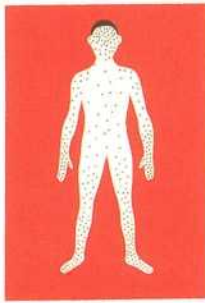


If smallpox is suspected notify the health authority immediately. Isolate the patient and vaccinate all contacts.



**smallpox**

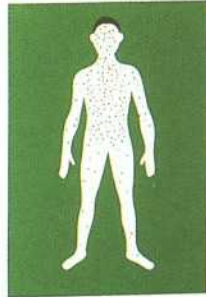
- The smallpox patient becomes ill between 7 and 17 days after close contact with someone who has the disease.
- The patient has fever and does not feel well for 2 to 4 days before a rash appears.
- The pocks are most numerous on the face, arms and legs.
- Pocks are usually present on the palms and soles.
- Scabs begin to form 10 to 14 days after the rash appears.
- Scabs fall off 14 to 28 days after the rash begins.



smallpox - distribution of the rash

**chickenpox**

- The chickenpox patient becomes ill between 14 and 21 days after close contact with someone who has the disease.
- The patient usually has no symptoms until the rash appears.
- The pocks are most numerous on the body.
- Pocks are seldom present on the palms and soles.
- Scabs begin to form 4 to 7 days after the rash appears.
- Scabs fall off within 14 days after the rash begins.



chickenpox - distribution of the rash

**Plate 10.10.** The right-hand portion of the poster in Plate 10.9. The text and drawings at the bottom gave simple indications by which to distinguish the signs and symptoms of smallpox from those of chickenpox.



**Plate 10.11.** The front and back of two versions of the shirt-pocket-size WHO smallpox recognition card produced in 1972. They were first used in India, and tens of thousands were eventually distributed to search workers throughout the subcontinent. The first version (upper pictures) was selected to portray a patient with relatively mild smallpox; it is a reduced version of the larger card shown in Plates 10.29 and 10.30.