

REGIONAL COMMITTEE FOR THE  
EASTERN MEDITERRANEAN

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ORIGINAL : ENGLISH

Agenda item 12 (b)

## SMALLPOX CONTROL AND ERADICATION

### I INTRODUCTION

The World Health Organization, since the beginning of its activities, has attached much importance to the smallpox problem, and in successive Resolutions the World Health Assembly and the Executive Board have stressed the need for proper quarantine measures, improvement and standardization of a suitable vaccine, development of mass vaccination campaigns and the strict enforcement of legislation to control the disease and eventually bring about its eradication.

But in spite of the action taken on these decisions by the health authorities of many countries, and the introduction of a thermostable vaccine which has contributed greatly to the availability of a potent vaccine at the time and place of vaccination, smallpox remains an important public health problem in several parts of the Eastern Mediterranean Region. Annex I summarizes the reported incidence of the disease in the countries of the Region during the last few years.

Since the Eleventh World Health Assembly in 1959, the concentration has been on the ultimate goal of smallpox eradication<sup>1</sup> and in pursuance of the Resolution adopted that year and those subsequently adopted by both Assembly and Executive Board, the problem of eradication as well as control was considered by the Regional Committee for the Eastern Mediterranean at its Ninth Session. Documents<sup>2</sup> submitted by the Regional Director formed the basis of the discussions. Following are the operative paragraphs of the Resolution<sup>3</sup> on the subject adopted by the Committee:

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<sup>1</sup>WHA.11/54, WHA.12/54, WHA.13/23, WHA.14/40 and EB23.R.71

<sup>2</sup>1954: RC4/EM/7 "Campaign against smallpox"  
1957: RC7/4 "Smallpox Control", RC7/5 "Dried Smallpox Vaccine"  
1958: RC8/5 "Smallpox Control", RC8/5 Add.1 "Eradication of Smallpox"  
1959: RC9/5 "Smallpox Control", RC9/5 Add.1 "Smallpox Eradication"

<sup>3</sup>EM/RC9/R.5 "Smallpox Control"

"The Regional Committee ...

1. CALLS upon the Governments of Member States, where smallpox endemic foci exist, to organize and conduct preventive campaigns by vaccinating or revaccinating at least eighty per cent of the population within a period of four to five years;
2. RECOMMENDS the use of dried smallpox vaccine in the mass vaccination campaigns in the Region;
3. RECOMMENDS to the Governments of adjoining States, members of WHO:
  - (1) to conclude agreements between themselves to institute simultaneous vaccination programmes at boundary zones, in order to create "immune barriers" and prevent importation of smallpox;
  - (2) to establish efficient quarantine control services at the land boundaries;
4. COMMENDS the Regional Director on his programme for smallpox control in the Region;
5. REQUESTS the Regional Director to provide countries with technical guidance and other assistance requested by health administrations for the implementation of their smallpox control and eradication programmes."

II ASSISTANCE PROVIDED BY THE REGIONAL OFFICE FOR  
THE EASTERN MEDITERRANEAN

As regards smallpox, the assistance provided so far to Member States by the Regional Office may be summarized as follows:

(a) Technical Advice

In order to provide countries with proper assistance in their campaigns against smallpox and the production of a suitable vaccine, a regional smallpox survey team<sup>1</sup> of two experts (an epidemiologist and a laboratory expert) was appointed. The team visited a number of countries of the Region from late 1958 to mid-1960. For each country visited, a detailed report was prepared and distributed to the governments concerned. The epidemiologist of the team also prepared a comprehensive final report<sup>2</sup> which is available to the Committee.

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<sup>1</sup>Project EMRO 16

<sup>2</sup>EM/Smpx/10, August 1960 (distributed with this document, EM/RC11/5)

The responsible officials of the Governments of the Region will find in this report a clear summary of the present situation and recommendations regarding the manifold technical and administrative aspects of smallpox eradication campaigns.

In this regard it should be mentioned that the Organization has prepared technical documents, which are available to interested Governments, dealing in great detail with the main aspects of smallpox control and eradication:

Smallpox Vaccination Techniques

WHO/Smallpox/9 - 3 July 1959

Organization of a Smallpox Eradication Service

WHO/Smallpox/10 - 7 July 1959

Evaluation of Smallpox Vaccination Programmes

(including an Annex on the Laboratory Tests in Diagnosis of Smallpox)

WHO/Smallpox/15 - 20 October 1960

A Stable Dried Smallpox Vaccine<sup>1</sup>

WHO/Smallpox/7 Rev.1 - 8 August 1960

Report of a Study Group: Requirements for Smallpox Vaccine

WHO Technical Report Series No.180 - 1959

Smallpox Vaccination: A Survey of Recent Legislations

"The International Digest of Health Legislation"

1954, 5, 221-262

(b) Training Courses and Conferences - Fellowships

Twenty-one fellowships have been provided so far to medical officers, bacteriologists and laboratory technicians of eight countries of the Region, to study the technique for the production of lyophilized vaccine, to familiarize themselves with the technical and administrative aspects of smallpox control and eradication, and to attend training courses and conferences organized by WHO. In late 1959 a Conference on Smallpox Eradication for countries in Africa was held at Brazzaville. In 1960, an Inter-Regional Smallpox Conference for the countries of Asia was held at New Delhi and a Training Course on Freeze Dried Vaccine production was carried out at Lagos, Nigeria. Plans are being made for other conferences and training courses in the future.

(c) Equipment for the Production of Freeze Dried Vaccine

As far as possible, using accrued savings in several instances, the requests received from governments of the Region in terms of equipment and supplies for

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<sup>1</sup>See Annex III

the production of vaccine have been met by the Regional Office. Particularly worth mentioning are the nine lyophilization apparatuses (all Edwards type with one exception).

(d) Equipment for Mass Vaccination Campaigns

In some instances, the Regional Office has provided transport, supplies and equipment to assist the governments in the implementation of their mass vaccination campaigns.

(e) Smallpox Vaccine

The Regional Office has given particular attention to the question of vaccine, and has offered technical advice on the production of a stable potent freeze-dried vaccine, able to withstand tropical conditions, to replace or supplement the glycerinated vaccine.

In some instances, the Regional Office has also provided glycerinated and dried vaccines in cases of emergency. The glycerinated vaccine donated by the Jordanian Government<sup>1</sup> was distributed to several countries of the Region during 1960. Vaccine donated by USSR was provided to two governments of the Region.

III THE SMALLPOX SITUATION IN COUNTRIES OF THE EASTERN  
MEDITERRANEAN REGION, JUNE 1961

The final report prepared by the epidemiologist of the Regional Smallpox Survey Team<sup>2</sup> describes the situation in the Eastern Mediterranean Region in 1960. Progress, though rather slow, has been made towards the eradication of smallpox: some countries are developing effective vaccination campaigns and expect to attain eradication in the near future; others have just started eradication programmes and many others are only at the planning stage or have not yet been able to take effective steps towards control and eradication.

The above mentioned report describes the difficulties existing, and to be surmounted, in the countries of the Region where smallpox is endemic, when plans are considered for the eradication of the disease.

The Director-General on 4 August 1960, sent a letter to all Member States asking for information regarding smallpox eradication programmes, either in

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<sup>1</sup>WHA.13/23

<sup>2</sup>Op.cit p.2 (distributed herewith)

operation or planning. From the replies received and from information gathered from other sources at the Regional Office, the situation in mid-1961, country-wise, may be summarized as follows:

ADEN COLONY

There is no eradication scheme in operation in the Aden Colony, but smallpox control is carried out by the medical officers of health and by the health officers who have a staff of twelve trained vaccinators. The population of Aden Colony is approximately 150,000 and during the three-year period 1957-1959 234,259 vaccinations were performed. The number of vaccinations carried out during 1960 was 78,916 which includes re-vaccinations.

During 1960 there were eight cases of smallpox which included three imported ones and five local which were contacts of the previous three. There were three deaths.

ADEN PROTECTORATE

The policy of eradicating smallpox from the Aden Protectorate in time with the world-wide effort urged by WHO has been planned by the Government to include an intensification of control measures and vaccination programmes with mass field vaccination around local foci of the disease along its lines of communication. There is no formal smallpox eradication scheme.

During 1960 five cases of smallpox were recorded in the Western Protectorate and none in the Eastern Protectorate. Vaccination, apart from that carried out in affected localities, was offered to a larger proportion of the population than previously and was available at all hospitals, health units and maternal and child health units. More infants, school children and State troops were vaccinated than previously. Both wet vaccine (from the Veterinary Institute at Asmara) and dried vaccine (from the Lister Institute, London) for units without refrigeration are used in the Protectorate.

Propaganda by leaflet, press and radio were used in furtherance of an "eradication" drive.

### C Y P R U S

Yearly island-wide vaccinations are carried out among the pre-school and school-age children at three-yearly intervals through the medium of maternal and child health clinics and schools. Vaccinations are carried out all the year round in every medical centre all over the island. The last case reported was in 1944 from among the army personnel. The last case reported from among the civilian population was in 1929.

### E T H I O P I A

Smallpox is endemic in the country. The Government had made a plan to carry out a mass vaccination campaign in the Shoa, Begemedir and Harrar provinces. For budgetary reasons and shortage of personnel, however, the Government decided to undertake the campaign through existing health services throughout the country.

At the Pasteur Institute in Addis Ababa, a lyophilization apparatus, "Secmul", is available. WHO provided some additional equipment and supplies for the production of dried vaccine and awarded a fellowship to the Chief of the Veterinary Services of the Institute for training at the Lister Institute in London.

Dried vaccine production started in 1960 and the State Serum Institute in Copenhagen confirmed that the vaccine produced was very satisfactory as regards purity, potency and heat stability. A quantity of 200,000 units is always kept in store and 500,000 units can be prepared within fifteen days. At present ten million doses of dried vaccine could be produced annually with a possibility of a considerable increase in the future.

In 1961, the Government intends to use one million doses of dried vaccine and one million doses of glycerinated vaccine. Combined yellow fever and smallpox vaccination might form the initial stage of a comprehensive mass vaccination campaign for the control of smallpox, aiming at the eventual eradication of this disease.

FRENCH SOMALILAND

No smallpox endemic foci have been reported from the territory, and no cases had been reported for ten years up to 1959 when, in September-October, an outbreak occurred (110 cases and ten deaths) along the Ethiopian Djibouti line. The source of infection was related to the introduction of a case from outside. A mass vaccination campaign was conducted and the outbreak was brought under control.

Smallpox may be considered as eradicated and the control measures by vaccination and revaccination are systematically maintained.

I R A N

A mass vaccination campaign indicated to be the first phase in an eradication scheme was conducted from March 1957 to December 1960 and covered approximately 80% of the total population. A house-to-house vaccination programme was adopted in this campaign and 250 vaccinators, 10 statisticians, 5 physicians and 80 vehicles for transportation were employed. Quarantine control measures were intensified on land routes and the nomadic groups of inhabitants are now being attended to. A second phase of the campaign is expected to start in 1962/1963.

Some data regarding the mass vaccination campaign 1957-1960 are reported as follows:

Total population under coverage	23,605,075 individuals
Total number of individuals vaccinated	20,757,209
Total number of individuals checked after vaccination	500,034
Total number of areas of work	45,936 villages
Total number of areas under inspection	15,880 villages

The result of this campaign is reflected in the number of smallpox cases and the number of deaths reported for the three last years:

	<u>Cases</u>	<u>Deaths</u>
During 1958	728	177
1959	321	37
1960	253	37

WHO awarded fellowships to a medical officer of the Pasteur Institute at Teheran to attend the Training Course for the preparation of Smallpox Vaccine at Lagos, Nigeria, in November 1960 and to the Director of the Communicable Diseases Control Department of the Ministry of Health in Teheran who attended the Conference on Smallpox at New Delhi in November 1960.

#### I R A Q

The Organization provided the Government with a lyophilization apparatus and necessary equipment and supplies for the preparation of dried smallpox vaccine. A laboratory consultant visited Iraq in 1959 and 1960 to assist in the production of a suitable freeze dried vaccine. Fellowships were awarded to the Chief of the Smallpox Vaccine Production Laboratory at Baghdad and to a technician of the same laboratory to study at the Lister Institute in London the technique used in the production of dried vaccine. Another fellowship was provided to a medical officer of the Department of Preventive Medicine in Baghdad to attend the Smallpox Conference at New Delhi in November 1960.

On 1 August 1959, a smallpox mass vaccination campaign was launched in the Republic of Iraq. The aim was to vaccinate all the inhabitants within a period of six months by the full cooperation of Iraqi and Soviet teams who worked in accordance with the agreement made between Iraqi and USSR representatives. For the execution of the campaign, the USSR provided a head physician, three senior physicians, thirty-two nurses, and three interpreters, the vaccine and vaccination equipment. The Government of Iraq contributed the entire facilities for transport and storage, and also provided adequate staff of physicians, nurses and vaccinators.

The whole campaign could not be completed within the target period for reasons of difficult accessibility to remote villages and marshy areas, and vaccination continued for a further few months.

Out of a total population of 6,538,104, the number of vaccinated inhabitants in the campaign was 4,554,785 using 3,255 male and 551 female vaccinators. Transport consisted of 214 vehicles, 13 boats and 149 animals.



I S R A E L

No smallpox cases have been reported since 1950. The vaccination programme includes (a) the compulsory vaccination of infants within the first year of life, immigrants, army recruits, travellers to and from countries where smallpox is endemic; also, the compulsory revaccination every three years of all personnel in Israeli ships and aeroplanes, and compulsory vaccination of all population at risk in case of impending epidemics; and (b) voluntary revaccination at the age of six years (required for school registration).

J O R D A N

By intensifying smallpox control measures, the Government of the Hashemite Kingdom of Jordan succeeded in maintaining an adequate level of immunity amongst the inhabitants and the disease has been absent for over three years since its last appearance, when an imported case was reported.

Obligatory vaccination of all new-born children, and a periodical mass vaccination takes place at three yearly intervals. A mass vaccination campaign, planned originally for April 1961, has been postponed to a later date.

Quarantine control measures are strictly conducted at different entries and exits of the country - by land, sea and air.

The Organization has under procurement for the Government a lyophilization apparatus and necessary equipment for the production of freeze-dried vaccine. A fellowship is being arranged for the Chief of the Production Unit of the Laboratory to study the techniques used in the production of dried smallpox vaccine. The Director of the Public Health Laboratory was awarded a WHO fellowship to attend the Conference on Smallpox in New Delhi in November 1960.

From the glycerinated vaccine donated to the Organization by the Jordanian Government a large number of doses were sent to three countries of the Region.

K U W A I T

No smallpox cases were reported from Kuwait during 1960 and until the time of writing in 1961, against nine cases reported in 1959. Dried vaccine from the Lister Institute, London, is used exclusively.

Kuwait legislation prescribes that primary vaccination should be given to children within the first three months of life. School children are vaccinated before admission to schools, but no legislation exists imposing such practice. Armed forces are vaccinated every three years as a part of the population receiving vaccine. Although no legislation exists to make general re-vaccination of the population compulsory, in practice re-vaccination is carried out regularly every three years. A comprehensive mass vaccination campaign was carried out in 1957 and a second campaign involving the vaccination of the entire population was started in 1959 and will be completed in 1961. All travellers entering the country are required to possess valid vaccination certificates.

#### LEBANON

The eradication campaign which started on 1 April 1960 was completed on 31 October 1960: 1,750,000 doses of glycerinated vaccine donated to the Organization by the Government of Jordan were used for the campaign in addition to 20,000 doses of Italian manufactured dried vaccine. 1,135,698 inhabitants were vaccinated, i.e. about 80% of the total population of the country.

The plans for 1961 are to continue smallpox vaccination in children's out-patient clinics.

According to the law passed on 8 June 1959 enforcing smallpox vaccination every four years, a new mass campaign will be carried out in 1964.

#### LIBYA

The recommendations made by the WHO Smallpox Survey Team which visited the three provinces of the country in late 1959 regarding the possibility of carrying out a smallpox eradication programme, were duly considered by the Government. Due to the limited number of personnel and transport facilities, the Government will not be able to implement these recommendations but has decided to organize a mass vaccination programme with the health personnel available at present, hoping to receive the assistance of international organizations for the provision of dried smallpox vaccine, transport and sundry equipment. The Government indicated that a law on smallpox will be promulgated in the very near future.

P A K I S T A N

Still harbouring much endemic foci, particularly in East Pakistan, the Government has decided to launch a smallpox eradication campaign both in East and West Pakistan, and provision was made in that respect in the health activities of the Pakistani second five-year plan (1960-1965). A pilot project started in East Pakistan in January 1961 to be completed at the end of June 1961 which involves a mass campaign in the two districts of Tippera and Faridpur with a total population of six and a half million inhabitants. WHO has arranged for the provision of five million doses of USSR donated dried vaccine for this pilot project. The eradication scheme for the whole province will be implemented on the lines indicated through the experience gained in the pilot project.

The Organization has provided the Government with a lyophilization apparatus and additional equipment and supplies for the production of dried smallpox vaccine. A consultant is under recruitment to assist in the production of a satisfactory dry vaccine.

WHO fellowships were awarded to two medical officers from East and West Pakistan to attend the Smallpox Conference at New Delhi in November 1960.

S A U D I A R A B I A

Smallpox is endemic in Saudi Arabia and the Government is most interested in undertaking an eradication campaign as early as possible. As a first step the Government is carrying out vaccination in the large cities of the Pilgrimage Area. Lister dry vaccine is being used.

A law was promulgated early in 1961 by the Government regarding control of smallpox in the country.

Plans are being made for the inclusion of lymph vaccine production within the Central Public Health Laboratory at Riyadh which is being established with the assistance of WHO.

S O M A L I A

Somalia is not an endemic area for smallpox. The last outbreak of the disease occurred in 1932 when a mass vaccination campaign was carried out. Since that time vaccination is performed regularly on the populations of cities and villages: School children, army, labourers, etc. and a strict control is made on persons leaving or entering the country by ship or by plane.

During 1960 the number of vaccination and re-vaccination were respectively 46,665 and 2825 in the southern and northern regions of the country.

During 1960 two cases of smallpox were reported in the northern region in January but none in the southern region.

The nomad population presents a problem, as a high percentage of this group has neither been vaccinated nor re-vaccinated.

The Government has indicated interest in the eradication programme recommended by the Organization and has requested WHO assistance without which the Government, for budgetary reasons, would not be able to implement an eradication campaign.

#### S U D A N

The health authorities have been intensifying smallpox control measures and vaccination programmes during the last seven years, whereby the incidence of cases was reduced to 117 (of which three were imported cases) in 1960, against 517 in 1959 and 3,030 in 1953-1954.

A plan for the eradication of the disease over a period of four years has been prepared by the Ministry of Health. The country will be divided into four zones and each year a complete zone will be vaccinated.

The first phase of the campaign is scheduled to start in November 1961 and will be completed in March 1962 covering the Kordofan and Darfour provinces with a total population of 3,417,000. WHO will assist this campaign as much as possible and has already provided vehicles, sterilizers, etc.

The Organization has provided a lyophilization apparatus and necessary equipment and supplies for the production of freeze-dried vaccine, at the Public Health Laboratory, Khartoum.

Fellowships were awarded to the Director of the Public Health Laboratory in Khartoum and the senior laboratory technician in charge of smallpox vaccine production to study the technique for the production of lyophilized vaccine. The same senior laboratory technician on a WHO fellowship, also attended the training course for production of dried smallpox vaccine at Lagos, Nigeria, in November 1960.

T U N I S I A

Compulsory general vaccination programmes are implemented in the Governorates every five years. Moreover, the vaccination and re-vaccination of the two months to seventeen year age-groups are attended to regularly by the public health services of the country. This system of smallpox immunization has resulted in the control of the disease and its absence from Tunisia.

Wet smallpox vaccine prepared at the Pasteur Institute in Tunis is used. No dried vaccine has been produced as yet.

PROVINCE OF EGYPT - UAR

Smallpox is not endemic in the Province of Egypt, UAR. As may be seen in Annex I, either no cases or only a very small number of cases are reported every year, of which some are imported by virtue of its geographical position on international trade routes.

Thanks to the regular vaccination of infants and the revaccination campaigns of the whole population which are undertaken every four years in the Province, as well as the revaccination of various groups of populations on certain occasions, the spread of smallpox infection, if imported, may easily be controlled.

Two fellowships were awarded by the Organization to enable two virologists of the Egyptian Province to attend training courses on dried smallpox vaccine production.

A fairly large number of doses of freeze-dried vaccine is being produced every year at the Agouza Laboratory, Cairo; and a number of field trial tests are regularly undertaken.

PROVINCE OF SYRIA - UAR

By expanding efforts of vaccination, the endemicity of the disease was overcome some years ago, and smallpox only appears as imported cases from neighbouring countries. This menace of the disease being introduced has not been overlooked by the health authorities, who are maintaining a strict vaccination programme for the Province.

A WHO-assisted freeze-dried vaccine unit to supplement the glycerinated vaccine manufactured in Damascus is now in the experimental stage of production.

The Organization awarded a fellowship to the Chief of the Vaccine Production Laboratory at Damascus, to attend the Training Course on Smallpox Vaccine Production at Lagos, Nigeria, in November 1960.

Y E M E N

Smallpox remains a major health problem in the Yemen. Epidemics both large and small occur periodically and the disease is endemic throughout the country. On an emergency basis, the Organization provided 5,000 doses of glycerinated vaccine from Egypt (UAR), 5,000 doses from the Jordanian donation in October 1960, and 30,000 doses of dry vaccine from the USSR donation to WHO, in March 1961.

A WHO epidemiologist visited the Yemen in February 1961 and following discussions with all concerned prepared a detailed report on the measures which might be taken by the Government towards the control and eventual eradication of the disease. The Organization will assist to the utmost any plans prepared by the Government in this regard.

ANNEX I

Data on the incidence of smallpox in  
1959, 1960 and the first quarter of 1961  
(Countries of endemicity)

Period	ETHIOPIA	IRAN	IRAQ	P A K I S T A N			SAUDI ARABIA	SUDAN
				East	West	Karachi		
<u>1959</u>								
J I	20	59 rev	0	797	123	22	7 rev	28 rev
F II	10	25	0	1 071	89	42	9	50
M III	36	46	0	1 146	66	37	18	63
A IV	37	0	0	1 478	138	24	28	95
M V	25	2	17	907	401	20	9	64
J VI	49	8	0	350	218	3	4	16
J VII	40	5	5	112	141	2	7	9
- VIII	22	29	0	124	82	0	9	2
A IX	17	33	0	92	47	0	9	1
S X	39	9	0	58	22	0	1	80
O XI	25	36	0	43	17	0	7	98
N XII	6	5	0	41	29	0	4	7
D XIII	26	64	1	73	25	0	3	4
<b>Totals:</b>	<b>352</b>	<b>321</b>	<b>23</b>	<b>6 292</b>	<b>1 398</b>	<b>150</b>	<b>115</b>	<b>517</b>

rev = revised figure

Period	ETHIOPIA	IRAN	IRAQ	P A K I S T A N			SAUDI ARABIA	SUDAN
				East	West	Karachi		
<u>1960</u>								
J I	30	32	0	83	126	2	3	0
F II	31	25	0	215	44	28	2	3
M III	21	10	0	176	96	41	1	7
A IV	32	2	0	211	45	9	3	14
M V	20	14	0	138	76	27	0	33
J VI	34	48	0	49	43	12	2	5
J VII	18	74	0	65	46	8	0	1
- VIII	26	16	0	22	46	2	0	2
A IX	12	35	0	24	25	2	0	5
S X	16	69	0	12	14	1	2	0
O XI	21	1	0	37	6	0	13	0
N XII	16	6	0	37	54	0	1	0
D XIII	17	30	0	17	135	1	5	65
Totals:	294	362	0	1,086	756	133	32	135

1961

J I	100	11	0	36	85	5	1	12
F II	88	12	0	88*	173*	8 <sub>n</sub>	0	2
M III	233	19	0	108*	91*	12*	0	54
A IV	139	+	+	35*	147*	62*	14	33
M V	42	+	+	+	129*	56*	2	1
J VI								2

\* preliminary data

+ data not yet available



## ANNEX II

Smallpox cases reported in countries of the  
Eastern Mediterranean Region  
1956 to date indicated

<u>Country</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>	
Aden Colony	0	13	75(24)	8(6)	8	1(1)	to 3 June
Aden Protectorate	0	58(21)	94(25)	53(46)	5	0	"
Bahrein	61	7	0	0	0	0	to 30 June
Cyprus	0	0	0	0	0	0	"
Ethiopia	545	368	569	352	294	640	to 3 June
Iran	1 616	952	318 rev	321	362	42	to 8 April
Iraq	2 173(1)	1 922(7)	6	23	0	0	to 31 March
Israel	0	0	0	0	0	0	to 30 June
Jordan	0	2	0	0	0	0	to 17 June
Kuwait	8	23	0	9	0	0	to 30 June
Lebanon	144	108	0	0	0	0	to 3 June
Libya	0	2	0	0	0	0	to 28 Feb.
Muscat & Oman	22	4	9	8	0	0	to 30 June
Pakistan	5 323	25 770	49 884	7 840	1 998	1 093*	-
West )	112	173	1 611	1 398	780	661*	to 27 May
East )	5 170	24 746	48 043	6 292	1 086	281*	to 6 May
Karachi )	41	851	230	150	132	151*	to 3 June
Saudi Arabia	99	65	143	115 rev	32	17	to 3 June
Somaliland	5	3	0	0	0	0	to 30 June
French Somaliland	0	0	0	110	0	0	to 10 June
Qatar	4	2(1)	1(1)	1	0	0	to 30 June
Sudan	438	285	49	517	135(3)	104	to 17 June
Trucial Oman	3	5	0	0	0	0	to 30 June
Tunisia	0	0	0	0	0	0	to 31 March
U A R							
Egyptian Prov.	1(1)	1(1)	0	31(1)	0	0	to 30 June
Syrian Prov.	0	41(41)	0	0	0	0	"
Yemen	D	KD	20	D	KD	D	

Figures within brackets are imported cases and are included in the totals

D = Data not available

KD = Epidemic but data not available

\* preliminary data

rev = revised figure

ANNEX III

A STABLE DRIED SMALLPOX VACCINE<sup>1</sup>

Description of the method used at the Lister Institute  
of Preventive Medicine, Elstree, Herts, England

(Note: This vaccine is prepared from a partially purified suspension of vaccinia virus elementary bodies derived from sheep pulp freeze-dried in 5.5 per cent, peptone and sealed in pure dry oxygen-free nitrogen at atmospheric pressure. Repeated batches of the vaccine have been shown to retain satisfactory potency after exposure to 45°C for at least eight weeks, and 37°C for at least three months. One batch has been exposed to 45°C for four years, after which time it still produced 100 per cent successful primary vaccinations.<sup>2,3</sup> In series production the conservative claim of retention of potency for one month at 37°C is made, but in practice this period may be expected to be considerably prolonged.)

Twenty-five grams of crude vaccinal sheep pulp are extracted in an efficient mechanical homogenizer with 250 ml McIlvaine's phosphate citric acid buffer 0.004M with respect to the phosphate at pH 7.2 containing 10 per cent. Arcton 113 (ICI trifluorotrchloroethane originally known as Arcton 63) and 0.4 per cent phenol.

This extract is centrifuged horizontally at low speed (1500 rpm) for five minutes in a size I International Centrifuge. The deposit containing the Arcton 113 is discarded and the supernatant fluid is kept at 22°C overnight. It is then plated to determine the bacterial count and is not used unless the bacterial count is less than 1000 organisms per ml and no pathogens are present. If the result of this test is satisfactory, the supernatant fluid is centrifuged at 10 000 g. for 30 minutes in an angle head and the deposit re-suspended in 40 ml of McIlvaine's buffer by mechanical homogenization. The phenol is thus eliminated by the centrifugation. The E.B.S. is now titrated by pock count and used for drying if the titre is at least  $5 \times 10^9$  i.u./ml.

After these procedures have been completed, one volume of E.B.S. is diluted ten times with 5.5 per cent peptone, made up as follows:

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<sup>1</sup>Document WHO/Smallpox/7 Rev.1 - 8 August 1960

A 5.5 per cent solution of bacteriological peptone is made in distilled water. The pH is adjusted to 8.0 with 40 per cent NaOH, after which the solution is heated to 90°C, and filtered while hot. The pH is then changed to 7.4 with 50 per cent HCl. The peptone solution is sterilized by autoclaving for 15 minutes at 15 lb pressure. The diluted suspension is then ampouled in 0.25 ml amounts and dried in an Edwards centrifugal freeze-drier.<sup>a</sup> The ampoules as obtained from the manufacturer are pre-constricted.\*

#### Primary drying

The ampoules are placed in the primary chamber. The centrifuge is started and evacuation begun.

"Snap-freezing" occurs about 15 minutes later when the vacuum has reached 1 - 2 mm Hg. The centrifuge is stopped shortly afterwards and drying is allowed to proceed for about five hours at a vacuum of 0.05 mm Hg. During this time heat may be supplied to the drying heads, the total input of watts being approximately equal to the number of ml of material being dried. Drying can be satisfactorily carried out overnight, if necessary, without the application of heat.

#### Secondary drying and sealing

After primary desiccation, the ampoules are removed from the chamber and plugged lightly with sterile, non-absorbent cotton wool. They are then attached to the manifolds and left for a further 18-20 hours at high vacuum over P<sub>2</sub>O<sub>5</sub>. They are sealed after filling with pure dry oxygen-free nitrogen at atmospheric pressure. If such nitrogen is unobtainable, the ampoules can be sealed under a vacuum of 0.01-0.03 mm Hg.

#### Vacuum testing

If pure oxygen-free nitrogen is unobtainable, the sealed ampoules are held at 4°C overnight, and are examined next day with a high frequency tester for retention of vacuum, those failing to give a blue-green fluorescence being discarded. Ampoules filled with nitrogen are tested by immersing them in water and evacuating the container. Broken ampoules will fill with water when the vacuum is released.

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<sup>a</sup> The centrifugal freeze-drier used is manufactured by Edwards High Vacuum Ltd., Crawley, Sussex, England.

The pressures are as measured in Pirani gauges.

\*Diagram (English only) attached to original document available at WHO.

Reconstitution

The dried material is reconstituted by adding 40 per cent glycerol in buffer to the original volume.

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