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SMALLPOX ERADICATION
SURVEILLANCE REPORT

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Smallpox Eradication Unit
World Health Organization
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PREFACE

Summarized in this report is information received from national governments, diagnostic and vaccine production laboratories, and other pertinent sources. The report is intended to provide those with a responsibility for smallpox eradication activities a concurrent appraisal of the progress of the global and national smallpox programmes as well as information regarding recent trends of the disease and other developments of particular interest. Information is frequently of a preliminary or provisional character and is subject to revision.

This report will be published initially on a quarterly basis and, after the first issue, will be available in both English and French.

Contributions to the report are most welcome. They should be addressed to - Chief, Smallpox Eradication Unit, World Health Organization, Geneva, Switzerland.

I SUMMARY

From review of the best available data regarding smallpox incidence during the period 1959-1967, it is apparent that the number of endemic countries is steadily declining. During 1966 and 1967, however, a sharp increase in reported cases has been observed. Most of this increase is attributable to outbreaks occurring in India and Pakistan although the smallpox incidence has also risen sharply in several African countries.

Eradication programmes have been initiated or are imminent in most endemic countries of South America, Africa and Asia. A number of donations of vaccine and equipment have already been made to WHO for smallpox eradication activities and this is being effectively augmented by bilateral assistance provided to national governments by the USA and the USSR.

A 'Handbook for Smallpox Eradication Programmes in Endemic Areas' has been developed and is now available for distribution.

Provision for emergency assistance to non-endemic countries has been made by WHO and is immediately available on request to member governments.

For more effective co-ordination of the global effort, regular reports regarding the occurrence of smallpox and the progress of eradication programmes are requested of all endemic countries. Methods for reporting are outlined.

In Appendix I is presented a summary of information relating to freeze-dried vaccine production facilities throughout the world.

II TRENDS IN SMALLPOX INCIDENCE

During the years 1959-1966

Presented in Tables I and II are the "best data available" to the Smallpox Eradication Unit regarding the occurrence of smallpox by country and by continent for the period, 1959-1966. For some countries and for some years, the data differ from those presented previously in official WHO publications. This may be accounted for principally by the recent submission of revised data by several of the countries. The data presented are thus subject to further revision as additional information is made available.

Since the 1958 resolution of the World Health Assembly to undertake a programme of smallpox eradication, the incidence of the disease has fluctuated without a definable trend in global incidence. After an initial decline in reported cases in 1960 to a level of 64 645, the incidence progressively rose to a peak of 122 927 cases in 1963. A sharp decrease to 59 000 cases in 1964 and 1965 was again followed by an increase in cases in 1966.

Fluctuations in the global incidence reflect, in major degree, variations in smallpox occurrence in three Asian countries, India, Indonesia and Pakistan, which annually account for 65 to 80% of the world total. Sharp decreases in incidence in India and Pakistan occurred coincident with national eradication programmes undertaken during the past five years. Although vaccination in conjunction with these programmes undoubtedly had a significant influence in suppressing smallpox occurrence, it is difficult to measure precisely the effect for two reasons: 1) disease reporting may have improved; 2) longer term five to seven year cycles of smallpox occurrence have long been observed in these countries. It is to be noted that, in 1960, before the advent of the intensive vaccination programme in India, the number of cases of smallpox was actually less than in 1966.

Despite the absence of a definitive trend in smallpox incidence in recent years, it is apparent from the three maps depicting smallpox rates by country for 1950, 1959 and 1966, respectively, that the number of countries with endemic smallpox has progressively declined. While an increasing incidence has been noted in recent years in certain Asian countries, others ceased to report smallpox during the 1959-1966 period and are now believed to be smallpox free. These include Iran, Malaysia, Thailand, Saudi Arabi and South Arabia.

In Africa, as in Asia, smallpox incidence in recent years has varied from year to year and from country to country. Notable successes, however, have been achieved in the past eight years in several countries including Ivory Coast, Mauritania, Senegal, Sudan and the countries of North Africa, all of which are now believed to be free from endemic smallpox.

In South America, smallpox has occurred primarily in Brazil and immediately adjacent areas in surrounding countries, including Argentina, Colombia, Paraguay and Peru. The reported incidence of smallpox during the past three years, however, has been notably less than in 1963 and preceding years.

Although the greatest number of smallpox cases is reported from Asian countries, smallpox incidence in 1966, as measured in cases per 100 000 population, was as high in many of the African countries and, in some instances, higher than in Asia (Table III). Rates in excess of 10 per 100 000 were recorded in eight African countries while, in Asia, only Indonesia exceeded this rate.

During 1967

Information regarding smallpox incidence during the first 28 weeks of 1967 is presented in Table IV by four week periods. The number of cases occurring during the comparable period in 1966 is also shown.

A total of 60 941 cases have been reported thus far in 1967, an increase of 40% over the comparable period in 1966. The number of cases thus far reported exceeds the total of cases recorded for all of 1964 or 1965. The increase in the overall total may be attributed principally to an increased incidence in the Asian countries although increases were also observed in Africa and the Americas (see below).

	<u>First 28 weeks</u>	
	<u>1967</u>	<u>1966</u>
Africa	9 554	9 291
Americas	426	235
Asia	50 958	33 912
Europe	3	71
	<u>60 941</u>	<u>43 509</u>

An increase of 200 or more cases was noted in the following countries:

		<u>First 28 weeks</u>		<u>Final Total</u>
		<u>1967</u>	<u>1966</u>	<u>1966</u>
Africa:	Dahomey	576	213	530
	Guinea	270	34	56
	Sierra Leone	975	102	293
Asia:	India	42 843	23 657	32 616
	Pakistan	6 812	3 377	6 116

In each of these five countries, the number of cases so far this year already exceeds the final totals reached during 1966. Eradication programmes are being initiated this year in Dahomey, Guinea and Sierra Leone; a programme in East Pakistan is expected to be initiated late in 1967; in India, the present vaccination programme is being reconsidered.

Although the number of cases of smallpox has increased, the geographical extent of endemic smallpox has not increased. Countries which have recently conducted systematic programmes of vaccination have remained smallpox-free with the exception of occasional imported cases. Notable examples include:

Reported cases of smallpox - 1962 to 1967

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967*</u>
Burma	32	195	112	8	1	0
Ivory Coast	2 141	282	11	8	0	2
Zambia	210	1 881	2 214	528	63	6

*First 28 weeks only

III PROGRESS IN ERADICATION PROGRAMMES

In most areas, eradication programmes are just beginning or are in the active planning stage. Detailed reports of progress have been received as yet from very few. A general review of eradication activities is presented below.

Americas

A five year programme of eradication for the South American countries has been drawn up and approved by the Regional Committee for the Americas.

Plans are now being developed with the respective countries. Since 1964, cases of smallpox have been reported only from Argentina, Brazil, Colombia, Paraguay and Peru and, during 1967, from Argentina and Brazil only. These two countries are thus of particular importance.

A programme in Brazil was initiated late in 1966. As of 12 August, 4 700 000 persons were reported to have been vaccinated. Smallpox surveillance and reporting has been strengthened and a weekly smallpox surveillance bulletin is being routinely issued. Through 26 August, 867 cases were recorded compared to 635 for the same period last year; almost half the cases were reported from Sao Paulo and the immediately surrounding area. The peak incidence of cases is not expected until the October-December period.

Africa

Nineteen countries in West and Central Africa initiated a regional smallpox eradication programme during 1967 with assistance provided principally by the USA with additional support from WHO. Vaccination activities have commenced in 15 of the countries and will begin in the remaining four within the next few months. Since the inception of the programme, over 10 million have been vaccinated in this region of 126 million persons. In Ibadan, Nigeria, an intensive, well-organized urban campaign successfully vaccinated over 800 000 persons during a 10 day period this summer; preliminary assessment revealed that over 85% of the population had been vaccinated.

Programmes assisted by WHO have begun in the immediately adjacent countries of Congo (Democratic Republic) and Sudan and are expected to begin later this year in Burundi, Kenya, Tanzania and Zambia.

Asia

An eradication programme in East Pakistan is expected to be initiated late in 1967 and in West Pakistan during 1968. WHO assisted programmes have been operative in Afghanistan and Nepal but will have to be intensified. Through 15 July, Afghanistan reported 61 cases compared to 63 during the same period in 1966; in Nepal, fewer cases have been recorded during 1967 than in 1966 but reporting is too incomplete to permit any conclusions to be drawn regarding the relative incidence of disease.

In India, more than 600 million vaccinations are reported to have been performed during a three year vaccination effort just concluded. However, major outbreaks of smallpox have occurred this year in several areas; the total number of cases during 1967 may be expected to exceed 60 000; except for 1963, the highest incidence during the past 9 years. Many of these cases are occurring in the lower economic "floating" and migrant populations in cities; studies of several outbreaks reveal that fully 80% of the cases are occurring among unvaccinated persons. The eradication programme is currently under review.

IV MANUAL FOR SMALLPOX ERADICATION PROGRAMMES

In July, a comprehensive "Handbook for Smallpox Eradication Programmes in Endemic Areas" was completed. This handbook, comprising over 200 pages in all, deals with both the technical and operational aspects of smallpox eradication programmes. It includes sections on clinical smallpox, vaccine and vaccination, operational components of the programme, assessment, surveillance and health legislation.

The English edition is presently available on request to all concerned with smallpox eradication activities. A French version will be available late in 1967. Requests for copies should be addressed to :

Chief, Smallpox Eradication
World Health Organization
Geneva, Switzerland

V EMERGENCY ASSISTANCE TO NON-ENDEMIC COUNTRIES IN CONTAINING INTRODUCED SMALLPOX

Restriction of smallpox to its present endemic limits is an important component of the strategy of global eradication. The occurrence of a single case in a smallpox-free country is cause for immediate, intensive action to prevent the re-establishment of endemic disease. It is important particularly for countries adjacent to endemic areas to maintain a high level of population immunity through vaccination, to ensure that an adequate case detection and reporting system exists and to take immediate action in the instance of an introduced case, including isolation of the case, vaccination and surveillance of contacts and community vaccination.

Immediate assistance in this effort can be provided by WHO. A special vaccine stockpile has been established in Geneva; technical assistance can be immediately provided. On request, these can be made available within 48 hours, barring only prohibitive transport difficulties.

VI DONATIONS TO THE WHO SPECIAL ACCOUNT FOR SMALLPOX ERADICATION

To carry out the global eradication programme, it was recognized that substantial external assistance would be required by the endemic countries. The WHO budget is estimated to provide only about one-third of the total need. Thus, substantial bilateral assistance as well as special donations to the Organization are required.

Both the USA and the USSR are now providing substantial bilateral assistance; the USA, in the form of technical assistance, equipment and vaccine to programmes in 19 West and Central African countries, the USSR in the form of large amounts of vaccine to programmes in Asia.

During 1966 and 1967, the Organization has thus far received donations of vaccine, equipment and cash from a number of countries as shown below:

A. Contributions in kind

	<u>Freeze-dried smallpox vaccine</u>	
Algeria	1 000 000	doses*
Cambodia	100 000	doses
France	200 000	doses*
Netherlands	1 600 000	doses
Pakistan	100 000	doses*
Philippines	120 000	doses
Sweden	1 000 000	doses*
Switzerland	4 750 000	doses
Thailand	200 000	doses
Tunisia	1 000 000	doses*
United Arab Republic	1 500 000	doses*
USSR	75 000 000	doses
Yugoslavia	1 000 000	doses
Turkey	50 000	doses

* Pending donations - all vaccine, prior to acceptance, must be tested by a WHO Reference Laboratory to assure that it meets the requisite requirements of potency, stability, and purity (according to WHO Technical Report Series No. 323, Requirements for Biological Products).

Other Items

Czechoslovakia - private manufacturers	2 Motorcycles
Japan - private manufacturers	120 Motorcycles
Poland	2 Vehicles
USA - University of Colorado	Laboratory equipment

B. Contributions in cash

	US\$
Democratic Republic of Congo	2 000
Greece	2 000
Kenya	840
Kuwait	2 800
Monaco	306
Nepal	2 564
Uganda	840

VII REPORTING TO WHO

Of major importance to the success of the global programme is an effective, current exchange of information between countries with respect to the status of smallpox in different areas, progress in the vaccination campaigns, epidemiological characteristics of the disease in different circumstances, useful operational techniques employed in different programmes, reports of recent technical developments, etc. It is anticipated that this surveillance report will, in a major way, serve this function.

For these reports to be current and meaningful, somewhat more information from the countries is required than is now submitted under the routine reporting provisions of the International Sanitary Regulations. To meet these special needs, monthly reports regarding smallpox (as described below) are requested from each of the endemic countries. These reports are not intended to replace present notification practices to the Organization, but to supplement them.

Content of reports

It is proposed that the reports consist of several parts.

- (1) Summary of smallpox cases by province, by age and sex and by Vaccination Status - Monthly - Form I

It is recognized that at the beginning all information noted in the tables will not be available for all countries. It is requested, however, that each country provide as much of this information as possible and take steps to collect the additional data on new cases as they occur.

- (2) Epidemiological investigations and reports - As available - No specific form

Data obtained from various outbreaks, analyses of trends of smallpox or of the socio-economic characteristics of cases and other studies are of interest. Summaries of these reports will be presented in the Smallpox Surveillance Reports with appropriate reference to the report-source, unless, for some reason, national authorities specifically request that certain reports not be published.

- (3) Operational aspects - As available - No specific form

Specific operational techniques and approaches to the eradication campaign may also be of general interest to those concerned with programmes in different countries. They should be dealt with in the same manner as the reports in (2).

- (4) Reports of vaccinations performed - Every three months - Form II

A simple record with respect to vaccinations performed (Form II) is requested every three months from each of the endemic countries. It is recognized that not all countries will be collecting separate information with respect to primary vaccinations and revaccinations, but it is requested that available information be promptly submitted.

Submission of reports

It is requested that reports be submitted 15 days after the conclusion of each monthly reporting period. Corrections with respect to past reports should be appropriately noted.

It is requested that all reports be submitted in two copies to the WHO Regional Office. One of these copies will be forwarded promptly to Geneva and the other retained at the Regional Office.

NATIONAL MONTHLY SMALLPOX MORBIDITY REPORT*

(for submission to WHO)

Country _____

Month _____

I. Check this box if there were no smallpox cases during this reporting period

II. SMALLPOX CASES BY AGE AND SEX, AND VACCINATION STATUS

Age Group	Number of cases				No. vaccinated before exposure		
	Male	Female	Unknown	Total	Vac.	Not vac.	Unknown
<1							
1-4							
5-14							
15+							
Unknown							
TOTAL							

III. GEOGRAPHIC DISTRIBUTION OF SMALLPOX CASES

Province	District or Division	No. of cases

IV. CORRECTIONS TO PREVIOUS REPORTS (additions or deletions)

* To be sent 15 days after close of reporting period whether or not information complete.

Form I

INSTRUCTIONS FOR
NATIONAL MONTHLY SMALLPOX MORBIDITY REPORT

1. Made by : Smallpox eradication programme director in each country.
2. Transmittal: The monthly smallpox morbidity report should be transmitted in two copies by mail by the fifteenth day of the succeeding month to WHO Regional Office.
3. Completeness of data : It is appreciated that at the beginning of the programme some of the data requested will not be available. It is requested that data which are available be sent on a regular basis and that every effort be made to obtain the data noted for future reports.
4. Corrections to previous reports: Both additions and deletions of cases should be noted.
5. How reports are used : These reports will be consolidated both on a regional and an international basis and will be included in a regular publication of information pertaining to the eradication programme which will be distributed to all countries.

TABLE 1

SMALLPOX CASES BY CONTINENT, 1959 - 1966
(SE Unit Data)

	1959	1960	1961	1962	1963	1964	1965	1966
AFRICA	16 307	16 823	26 060	24 329	16 863	12 506	16 784	14 127
ASIA	71 309	39 843	53 957	63 616	98 784	43 537	39 145	50 494
EUROPE	26	47	24	136	129	-	1	71
NORTH AMERICA	-	-	-	1	-	-	-	-
SOUTH AMERICA	5 490	7 931	9 026	9 718	7 151	3 398	3 515	3 092
OCEANIA	-	1	-	-	-	-	-	-
TOTAL	93 132	64 645	89 067	97 800	122 927	59 441	59 445	67 784

TABLE II

SMALLPOX CASES BY COUNTRY, 1959 - 1966
(SE Unit Data)

	1959	1960	1961	1962	1963	1964	1965	1966
AFRICA								
Algeria	11	7	8	1	-	-	-	-
Angola	7	-	-	23	50	1	-	3
Botswana	5	31	36	8	2	175	-	-
Burundi	-	-	8	26	3	-	1 213	363
Cameroon	17	-	1 445	743	135	72	-	3
Centr. Afr. Rep.	-	1	-	57	3	-	-	-
Chad	17	2	502	769	10	5	73	-
Congo (Braz.)	-	-	23	1 254	1 476	198	89	2
Congo (Dem. Rep.)	2 471	1 408	3 624	3 775	5 525	2 191	3 783	1 913
Dahomey	1 708	7 68	119	132	249	718	168	530
Equatorial Guinea	-	1	-	-	-	-	-	-
Ethiopia	367	293	761	360	232	104	58	228
Fr. Somaliland	110	-	-	-	-	-	-	52
Gabon	-	-	-	1	111	49	1	-
Gambia	3	7	12	4	52	6	6	3
Ghana	104	139	70	145	23	9	7	13
Guinea	441	176	96	2 948	224	320	69	56
Ivory Coast	784	1 634	4 656	2 141	282	11	8	-
Kenya	572	347	336	218	249	273	276	159
Lesotho	1	-	84	52	-	-	-	-
Liberia	1 869	136	1 116	325	88	958	40	32
Malawi	559	795	1 465	634	359	720	228	88
Mali	772	1 212	1 706	1 521	1 096	343	659	281
Mauritania	32	123	12	40	1	-	-	-
Mozambique	44	14	91	69	102	243	115	19
Niger	1 149	2 408	1 740	887	445	30	463	1 147
Nigeria	1 599	4 140	3 600	3 864	1 778	1 430	4 566	4 924
Port. Guinea	24	1	11	2	2	-	-	-
Ruanda Urundi	77	12	-	-	-	-	-	-
Rwanda	-	-	10	30	-	-	5	-
Senegal	487	6	201	231	87	2	-	-
Sierra Leone	96	12	6	78	14	90	60	293
Somalia	94	2	-	-	-	-	-	-
S. Africa	-	65	8	103	254	301	72	?
Southern Rhodesia	133	12	3	15	38	200	40	33
Sudan	336	162	8	95	-	-	64	-
Swaziland	-	-	-	-	182	517	85	29
Tanzania	1 442	1 584	915	1 048	867	1 461	2 743	3 027
Togo	66	347	281	571	285	34	13	199
Uganda	334	502	423	628	419	523	1 338	591

	1959	1960	1961	1962	1963	1964	1965	1966
<u>AFRICA (Contd.)</u>								
United Arab Republic	30	-	-	-	-	-	-	-
Upper Volta	368	126	2 451	1 321	339	8	14	76
Zambia	178	350	233	210	1 881	2 214	528	63
TOTAL	16 307	16 823	26 060	24 329	16 863	12 506	16 784	14 127
<u>ASIA</u>								
Afghanistan	441	111	176	303	571	178	71	75
Burma	1 533	392	90	32	193	112	8	1
Cambodia	4	-	-	-	-	-	-	-
Ceylon	-	-	44	66	1	-	1	-
India	47 693	31 091	45 380	55 595	83 423	40 265	33 402	32 616
Indonesia	1 129	5 193	5 045	3 435	7 882	1 870	3 990	11 296
Iran	253	341	96	16	6	1	-	-
Iraq	23	-	-	-	-	-	-	1*
Korea	-	3	1	-	-	-	-	-
Kuwait	10	-	-	1	-	-	-	-
Malaysia	38	15	-	-	-	-	-	5*
Muscat and Oman	8	-	-	8	-	-	-	-
Nepal	...	...	5	...	779	99	84	385
W. Pakistan	3 373	815	2 408	3 484	1 929	935	1 285	2 935
E. Pakistan	15 048	1 805	660	656	3 995	72	304	3 181
Quatar	1	-	1	-	-	-	-	-
Saudi Arabia	115	32	17	1	-	-	-	-
Singapore	10	-	-	-	-	-	-	-
South Arabia	70	13	1	-	-	-	-	-
Thailand	1 548	32	33	2	-	-	-	-
Trucial Oman	...	...	...	17	-	-	-	-
Vietnam	12	-	-	-	-	-	-	-
Yemen	...	...	...	...	5	5	-	1
TOTAL	71 309	39 843	53 957	63 616	98 784	43 537	39 145	50 494
<u>EUROPE</u>								
TOTAL	26	47	24	136	129	-	1	71
<u>NORTH & CENTRAL AMERICA</u>								
TOTAL	-	-	-	1	-	-	-	-

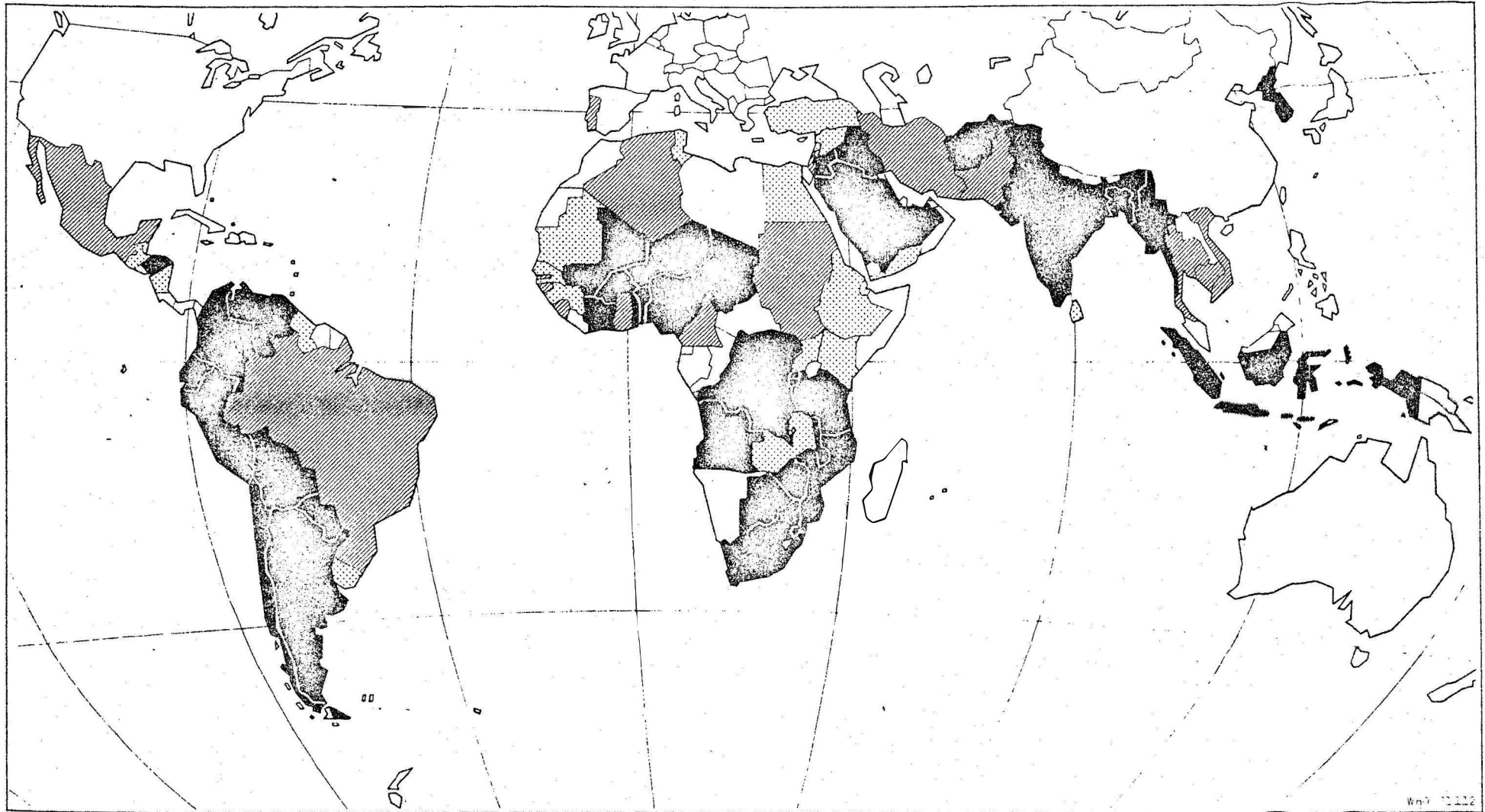
	1959	1960	1961	1962	1963	1964	1965	1966
<u>SOUTH AMERICA</u>								
Argentina	36	65	6	2	-	13	15	21
Bolivia	7	1	-	-	-	5	-	-
Brazil	3.356	5.417	8.507	9.450	6.236	2.853	3.234	3.039
Chile	1	-	-	-	-	-	-	-
Colombia	950	209	16	41	4	21	216	8
Ecuador	1.140	2.185	496	204	45	42	-	-
Paraguay	-	35	-	-	-	7	32	5
Peru	-	-	-	-	865	454	18	19
Uruguay	-	19	1	10	1	3	-	-
Venezuela	-	-	-	11	-	-	-	-
TOTAL	5.490	7.931	9.026	9.718	7.151	3.398	3.515	3.092
<u>OCEANIA</u>								
TOTAL		1						




... Data not available

* Imported cases (1966)

- No cases

FIG. 1
SMALLPOX INCIDENCE IN ENDEMIC COUNTRIES - CASES PER 100000 POPULATION
1950




-  > 5.0 cases per 100 000 population
-  0.5 - 5.0 cases per 100 000 population
-  < 0.5 cases per 100 000 population


No reports received from China (mainland), Kuwait, Liberia, Morocco, Muscat & Oman, Nepal, Panama, Qatar, South-West Africa, Trucial Oman and Yemen


FIG. 2

SMALLPOX INCIDENCE IN ENDEMIC COUNTRIES - CASES PER 100 000 POPULATION
1959



 > 5.0 cases per 100 000 population

 0.5 - 5.0 cases per 100 000 population

 < 0.5 cases per 100 000 population

No reports received from China (mainland), Nepal
South-West Africa, Truciol Oman and Yemen.

TABLE III

SMALLPOX INCIDENCE - CASES PER 100 000 POPULATION - 1966
(Based on SE Unit Data)

Continent	Pop. (in 000's)*	No. of Cases	Cases/100 000
<u>AFRICA - WEST</u>			
Cameroon	5 103	3	.06
Congo (Brazzaville)	826	2	.20
Dahomey	2 300	530	23.04
Gambia	324	3	.92
Ghana	7 537	13	.20
Guinea	3 420	56	1.63
Liberia	1 041	32	3.07
Mali	4 485	281	6.26
Niger	3 237	1 147	35.43
Nigeria	56 400	4 924	8.73
Sierra Leone	2 240	293	13.08
Togo	1 603	199	12.41
Upper Volta	4 750	76	1.60
<u>AFRICA - EAST AND SOUTH</u>			
Angola	5 084	3	.06
Burundi	2 800	363	12.96
Congo (Dem. Rep.)	15 300	1 913	12.50
Ethiopia	22 200	228	1.03
Fr. Somaliland	81	52	64.20
Kenya	9 104	159	1.75
Malawi	3 900	88	2.26
Mozambique	6 872	19	.28
Southern Rhodesia	4 140	33	.80
Swaziland	288	29	10.07
Tanzania	9 990	307 3207	32.02 3.07
Uganda	7 367	591	8.02
Zambia	3 600	63	1.75
<u>ASIA</u>			
Afghanistan	15 227	75	.49
Burma	24 229	1	.004
India	471 624	32 616	6.92
Indonesia	102 200	11 296	11.05
Nepal	9 920	385	3.88
West Pakistan	47 000	2 935	6.24
East Pakistan	54 000	3 181	5.89
Yemen	5 000	1	.02

Continent	Pop. (in 000's)*	No. of Cases	Cases/100 000
<u>SOUTH AMERICA</u>			
Argentina	22 022	21	.09
Brazil	78 809	3 039	3.86
Colombia	17 482	8	.05
Paraguay	1 968	5	.25
Peru	11 298	19	.17

* Mid-year estimate for 1964

TABLE IV

CASES BY FOUR WEEK PERIOD THROUGH 15 JULY, 1967,
AND FOR THE COMPARABLE PERIOD IN 1966.
(Data submitted to WHO through 25 August)

	Four week period ending							TOTAL	Same Period* 1966
	Jan.28	Feb.25	Mar.25	Apr.22	May 20	Jun.17	Jul.15		
<u>AFRICA - WEST</u>									
Cameroon	1	2	-	-	-	-	0	3	3
Chad	-	-	1	3	-	-	38	42	-
Congo (Brazzaville)	-	-	-	-	-	-	0	-	4
Dahomey	45	177	55	78	78	64	79	576	213
Gambia	-	-	-	-	-	-	0	-	3
Ghana	1	-	-	2	15	12	1	31	12
Guinea	2	25	6	44	15	24	154	270	34
Ivory Coast	-	-	2	0	-	-	0	2	-
Liberia	-	3	-	-	-	-	0	3	-
Mali	3	3	66	31	13	0	0	116	223
Niger	99	324	212	224	40	37	27	963	791
Nigeria	370	842	940	771	858	337	152	4 270	4 181
Sierra Leone	8	60	83	280	112	214	218	975	102
Togo	8	44	3	12	9	14	18	108	40
Upper Volta	1	8	1	52	7	1	0	70	52
<u>AFRICA - EAST AND SOUTH</u>									
Angola	-	-	-	-	-	-	0	-	3
Botswana	-	1	-	-	-	-	0	1	-
Burundi	-	14	-	-	1	0	1	16	139
Congo (Dem. Rep.)	87	71	233	130	194	62	70	847	799
Ethiopia	48	46	54	23	28	27	34	260	76
Fr. Somaliland	-	-	-	-	-	-	0	-	52
Kenya	9	5	6	7	2	8	1	38	133
Malawi	2	1	-	-	3	2	0	8	35
Mozambique	-	1	1	-	-	-	0	2	14
Southern Rhodesia	-	2	-	-	2	-	0	4	5
Swaziland	-	-	-	-	-	-	0	-	26
Tanzania	108	136	120	140	75	107	71	757	1 877
Uganda	31	26	16	11	15	35	52	186	424
Zambia	-	-	2	2	0	0	2	6	50
TOTAL	823	1 791	1 901	1 810	1 467	944	918	9 554	9 291

	Four week period ending							Same	
	Jan.28	Feb.25	Mar.25	Apr.22	May 20	Jun.17	Jul.15	TOTAL	Period* 1966
<u>AMERICA</u>									
Argentina	2	4	1	1	-	-	0	8	-
Brazil	71	69	63	34	34	43	104	418	223
Colombia	-	-	-	-	-	-	0	-	5
Paraguay	-	-	-	-	-	-	0	-	5
Peru	-	-	-	-	-	-	0	-	2
TOTAL	73	73	64	35	34	43	104	426	235
<u>ASIA</u>									
Afghanistan	8	14	6	1	3	13	16	61	63
Burma	-	-	-	-	-	-	0	-	1
India	4 924	8 081	9 601	8 515	6 724	3 446	1 552	42 843	23 657
Indonesia	73	128	74	111	152	61	531	1 130	6 477
Iraq	-	-	-	-	-	-	-	-	1
Kuwait	-	-	-	12	29	-	-	41	-
Nepal	73	-	-	-	-	57	14	144	3
East Pakistan	107	355	593	1 424	1 311	719	-	4 509	2 166
West Pakistan	1 006	667	244	99	65	50	86	2 303	1 211
Trucial Oman	-	-	7	1	-	2	-	10	-
Yemen	-	3	-	-	-	-	-	3	-
TOTAL	6 191	9 248	10 525	10 163	8 284	4 348	2 199	50 958	33 912
<u>EUROPE</u>									
Czechoslovakia	-	-	1	-	-	-	-	1	-
Germany, Fed. Rep.	-	-	1	1	-	-	-	2	-
United Kingdom	-	-	-	-	-	-	-	-	71
TOTAL	-	-	2	1	-	-	-	3	71
WORLD TOTAL								60 941	43 509

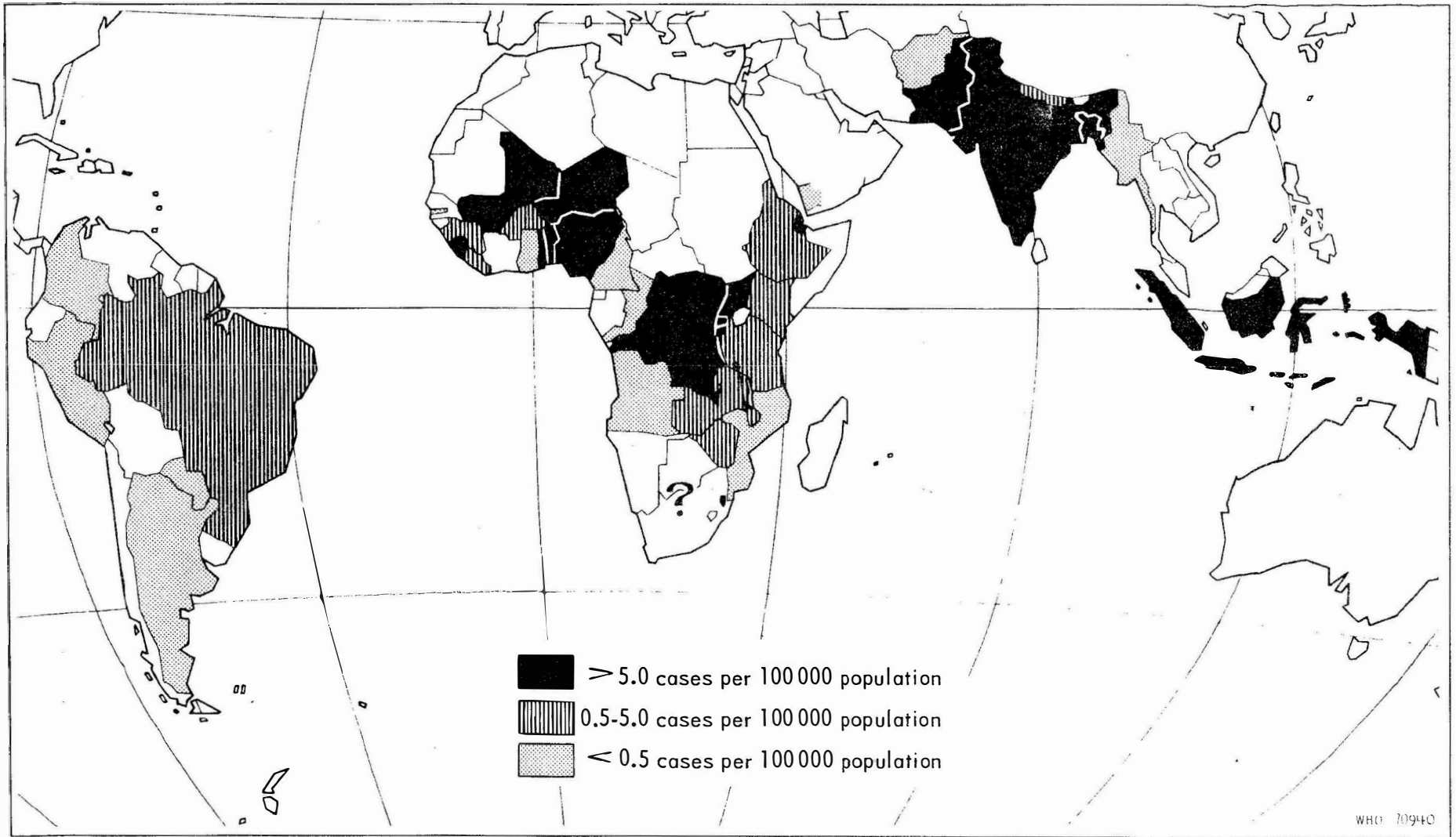
* From Epidemiological and Vital Statistics Reports, WHO, 20 : 311-358, 1967.

** Additional reports received by Smallpox Eradication Unit, WHO.

- No Cases

FIG. 3

SMALLPOX INCIDENCE IN ENDEMIC COUNTRIES CASES PER 100 000 POPULATION - 1966



APPENDIX I

FREEZE-DRIED VACCINE PRODUCTION

In the Spring of 1967, the Smallpox Eradication Unit undertook a survey of the status of freeze-dried vaccine production throughout the world. Efforts were made to identify the location of all present or planned production facilities and questionnaires were sent to each requesting information regarding strain of vaccine virus used, results of vaccine testing, etc.

On the basis of current information, freeze-dried smallpox vaccine is now being produced in 63 laboratories in 43 countries (Table 1); production of vaccine is being planned in nine additional laboratories. As of 15 September, questionnaires regarding vaccine production had been received from 38 laboratories in 29 countries.

In 35 of the 38 laboratories, the vaccinia virus is harvested from calves (28) or sheep (9); three laboratories are producing vaccine in chick embryos and three in tissue culture (bovine embryo fibroblast) (Table 2).

The virus strains originally used to initiate vaccine production are diverse although it is probable that many, including a substantial proportion of those listed in the category "other" have a common ancestry. Of 38 laboratories for which information was provided, 14 employed the Lister strain and five the New York City Board of Health strain; no other strain was used by more than three laboratories (Table 3).

Various sized ampoules and vials are used in the different laboratories. About one-third of the laboratories provide vaccine in two or more different sized containers. Those using only a single-sized container normally employ 20, 25 or 50 dose ampoules or vials. To dry vaccine in ampoules containing less than this amount is excessively costly, while use of containers of 100 doses or larger often results in substantial vaccine wastage. Lyophilization equipment used in the different laboratories was recorded as having been produced by at least 11 different manufacturers.

Pctency, heat stability and bacterial counts of vaccine

Information with regard to the potency, heat stability and bacterial counts of the last three batches of vaccine produced, was requested from each of the laboratories.

In most instances, reported vaccine potencies met WHO standards.

Twenty-six of 33 laboratories which measured potency on the chorioallantoic membrane (CAM) reported satisfactory titers for all lots ($>10^8$ PFU per mL) (Table 4). Lots failing to meet this recommended minimum titer were recorded as being in the range of $10^{7.5}$ to $10^{7.9}$. Reports of titers from two laboratories were recorded in such a manner as to suggest that the usual testing method was not well understood. Five laboratories recorded results determined by the rabbit scarification technique, an acceptable technique of testing only if the results have been shown to correlate with those obtained on CAM (WHO Technical Report Series No. 323).

The results of tests for heat stability of the vaccine were much less satisfactory. Only 13 of 38 laboratories recorded satisfactory results for all lots reported (titer of greater than $10^{8.0}$ PFU/mL after incubation of dried vaccine at 37°C . for 30 days); 13 laboratories reported some or all lots to be unsatisfactory (Table 5). Seven laboratories recorded no results whatsoever; in some of these laboratories, it is probable that no stability testing whatsoever is carried out. Of 75 lots tested by CAM, 13 had titers lower than $10^{7.5}$ PFU/mL after incubation of the vaccine at 37°C . for 30 days (Table 6). In the tropical and subtropical areas, particularly, failure to employ vaccine of requisite stability could be disastrous to a programme.

Bacterial content, required to be less than 500 non-pathogenic organisms per mL under WHO standards, was satisfactory in most laboratories (Table 7). Of 92 lots tested and reported, only eight exceeded the maximum acceptable limit. These were reported from four separate laboratories, one in each of the continental areas. Of the 39 lots for which a nil bacterial plate count was recorded, 18 were produced on chick embryo or on tissue culture. Only two laboratories which produce vaccine in calves or sheep reported three consecutive lots with a nil bacteria count.

Summary

In the global eradication programme, the importance of using fully potent stable freeze-dried vaccine cannot be too strongly emphasized. Approximately 80 to 90% of the cost of eradication programmes is expended in transport and personnel, that is, in getting the vaccine to the individual. This money is totally wasted if impotent vaccine is used.

Laboratory testing plays an important role for even vaccine of **suboptimal** potency may induce a high proportion of primary takes and yet be virtually ineffective in revaccines and in newborn children.

Arrangements have been made by WHO to test, free of charge, lots of vaccine submitted to it. Routine, periodic testing of vaccine produced in all endemic countries is particularly encouraged. For testing of vaccine, at least 10 ampoules or vials with diluent which after reconstitution, will yield at least 10 ml. of vaccine suspension, should be submitted to :

Chief, Smallpox Eradication
World Health Organization
Geneva. Switzerland

Table 1

Laboratories Producing or
Planning to Produce
Freeze-dried Smallpox Vaccine

	Laboratories now producing freeze- dried vaccine	Laboratories in process of development	Production information sub- mitted to WHO
<u>Africa</u>			
Algeria	1		-
Congo (Dem. Republic)	1		1
Ethiopia	1		1
Guinea		1	
Kenya	1		1
Nigeria	1		1
Senegal		1	
Tunisia	1		-
Union of South Africa	1		-
United Arab Republic	1		1
<u>Americas</u>			
Argentina	1		1
Bolivia	1		-
Brazil	4		3
Canada	1	1	1
Chile	1		1
Colombia	1		-
Cuba		1	
Ecuador	1		-
Peru	1		-
USA	3		3
Venezuela	1		1
<u>Australasia</u>			
Australia	1		1
Burma		1	
Cambodia	1		1
India	4		4
Indonesia	1		1
Iraq	1		1
Japan	6		1
Pakistan	1		-
Philippines	1		1
Taiwan	1		1
Syria	1		1
Thailand	1		1

Table I contd.

APPENDIX I contd.

	Laboratories now producing freeze- dried vaccine	Laboratories in process of development	Production information sub- mitted to WHO
<u>Europe</u>			
Austria		1	
Belgium		1	
Bulgaria	1		1
Czechoslovakia	1		1
France	1	1	1
Germany	3	1	3
Hungary	1		-
Italy	1		-
Netherlands	1		-
Portugal	1		1
Sweden	1		-
Switzerland	1		1
Turkey	1		1
United Kingdom	1		1
USSR	6		-
Yugoslavia	1		1

Table 2Medium for Production of Vaccinia Virus

	No. of Laboratories reporting	Calves	Sheep	Chick Embryo	Tissue Culture
AFRICA	4	2	2	0	0
AMERICAS	10	7	0	3	0
AUSTRALASIA	13	10	3	0	0
EUROPE	11	9	3*	0	3*
	38	28*	8*	3	3*

* Two laboratories employ both calf and bovine embryo fibroblast tissue culture and one uses sheep in addition to these two.

Table 3Vaccinia Strains Used
to Initiate Productions

	No. of Laboratories reporting	Lister	New York City	Berne	Institute Pasteur	Other**	Un- known
AFRICA	4	2	0	0	0	0	2
AMERICAS	10	2	5	0	1	2	0
AUSTRALASIA	13	6	0	0	2	2	3
EUROPE	11	3*	0	3*	0	5	1
	38	14*	5	3*	3	9	6

* One laboratory employs two strains

** Includes strains termed: Massachusetts 999, Institute Chambon (Paris), Ikeda, Vienna, Bohemia, Academy of Medicine (Paris), Hamburg, Bordeaux.

Table 4

Potency of Vaccine

	No. of Laboratories	All lots Satisfactory	Some lots Satisfactory	No lots Satisfactory	Rabbit Test Only	No Report
AFRICA	4	3	0	0	1	0
AMERICAS	10	4	2	1	2	1
AUSTRALASIA	13	10	0	1	1	1
EUROPE	11	9	1	0	1	0
	38	26	3	2	5	2

Table 5

Vaccine Stability after incubation
at 37°C. for 30 days

	No. of Laboratories	All lots Satisfactory	Some lots Satisfactory	No lots Satisfactory	Rabbit Test Only	No Report
AFRICA	4	2	0	1	1	0
AMERICAS	10	0	2	3	2	3
AUSTRALASIA	13	5	2	1	1	4
EUROPE	11	6	1	3	1	0
	38	13	5	8	5	7

Table 6

Vaccine Stability by Lots

	No. of labs. reporting and using CAM	No. of lots reported	<u>Titer of Vaccine (CAM)</u>		
			$> 10^8$	$10^{7.5-7.9}$	$< 10^{7.5}$
AFRICA	3	9	6	0	3
AMERICAS	5	15	4	8	3
AUSTRALASIA	8	4	18	2	4
EUROPE	10	27	18	6	3
	26	75	46	16	13

Table 7Bacterial Counts per ml.

	No. of labs. reporting	No. of lots	<u>Bacterial Counts per ml.</u>				
			0	1-9	10-99	100-499	500+
AFRICA	3	9	0	0	2	5	2
AMERICAS	10	28	20	2	2	1	3
AUSTRALASIA	12	27	5	3	7	10	2
EUROPE	10	28	14	7	5	1	1
	35	92	39	12	16	17	8

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		<u>Average pages</u>		<u>Total for year</u>
1968	Nos. 1-6	2.0	}	42
	7-14	5.2		
1969	15-25	7.3	(total 25)	70

<u>No. of pages</u>	<u>No. of issues 1968</u>	<u>1969⁺</u>
2	6	0
3	0	0
4	1	2
5	4	2
6	3	1
7		4
8		0
9		2

* From No. 25