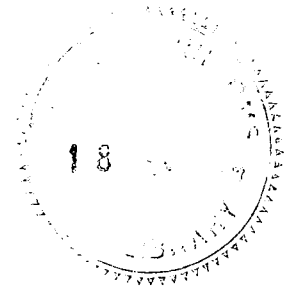




IMPORTATIONS OF SMALLPOX INTO EUROPE  
1961-1973

by

Donald A. Henderson, M.D.  
Chief Medical Officer, Smallpox  
World Health Organization, Geneva, Switzerland



During the 13-year period, 1961-1973, smallpox was introduced into Europe on 29 separate occasions. The United Kingdom and the more northern of the continental countries were most frequently affected (Fig. 1) whether because of more frequent travel between these countries and endemic areas or for other reasons is not known.

The sources of infection for 22 of the 29 introductions were Asian countries; the infection was brought from Africa in five instances; in two instances, the source was uncertain (Table 1). The 1963 introduction into Hungary may have been related to the immediately preceding outbreak in Poland. The source of infection for the 1966 outbreak of variola minor in the United Kingdom was never determined although undoubtedly it originated either in South America or South Africa, the only two areas where variola minor was known to exist at that time. In two instances, further transmission occurred from one country within Europe to another. In 1970, a single case occurred in Norway in a patient exposed to a case in Denmark and in 1972, a case occurred in the Federal Republic of Germany in a man exposed in Yugoslavia.

Introductions of smallpox into Europe have become less and less frequent in recent years. In the three-year period, 1961-1963, 17 importations occurred, an average of more than five each year. Over the next five-year period, eight importations occurred, and during the most recent five years, only four importations - an average of less than one importation each year (Fig. 2). Only two of the four importations during the past five years were from countries which as of December 1973 were still endemic for smallpox.

The frequency of importations, not unexpectedly, is closely associated with the incidence of smallpox in the endemic countries themselves. As the number of endemic countries as well as the afflicted areas within the endemic countries has decreased, the probability that an individual may become infected and develop the disease after arrival in Europe has likewise diminished. As shown in Table 2 all persons importing smallpox into Europe since 1961 have been infected in countries reporting 3.0 cases or more per 100 000 inhabitants with the exception of Iraq. From 1961 to 1963 24 to 29 countries recorded rates of this magnitude and a total of 54 to 61 countries reported one or more cases. In 1973, only six countries recorded rates of 3.0 cases or more per 100 000 of the total of 11 countries reporting cases (Fig. 3). As of December 1973, only four countries were considered still to be endemic for smallpox.

It is of particular interest that this decrease in importations has occurred despite a considerable increase in the amount of air travel. However, 24 of the 27 importations for which the mode of travel is known were associated with air travel. The two outbreaks in which the infected person travelled by ship were both recognized on, or before, the arrival

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of the ship in port; control measures were promptly instituted and the outbreaks were rapidly contained. In a third outbreak, the patient travelled by bus from Iraq to Yugoslavia.

Travel by air frequently includes further travel within the country during the incubation period of the disease, thus presenting special problems. Recognition and notification of smallpox by physicians is often greatly delayed since they may not suspect the disease or may be in doubt regarding the correct diagnosis, being unfamiliar with the clinical picture. Delays in diagnosis of two or more weeks have been frequent and in at least three instances more than four weeks elapsed before smallpox was diagnosed.

Most importations have resulted from a national of the country concerned becoming infected and bringing the disease back to his home country. In outbreaks occurring in Czechoslovakia, the Federal Republic of Germany, Poland, Spain, Sweden and Yugoslavia as well as the 1973 importation into the United Kingdom, residents of these countries were responsible for introducing the disease into their home countries. Since cases of smallpox are exceptionally rare among persons successfully vaccinated within the preceding three years, it is reasonable to conclude that many if not most of these outbreaks might have been prevented if persons travelling abroad had been adequately protected prior to their departure.

Once the disease is introduced into a country further transmission usually occurs in the home, or more often, in the hospital. Of the 568 cases listed in Table 1, 27 represent index cases infected abroad; an additional 24 (outbreak 12) occurred among members of a ship's crew while in quarantine. Of the remaining 517 cases, 245 (47%) were infected in a hospital or during the course of medical or nursing duties. The role of hospitals in the further dissemination of infection and the risk to both other patients and personnel cannot be over-emphasized.

The period from December to May is of particular importance as this six-month period coincides with the usual seasonal increase in smallpox in countries in the northern hemisphere, from which the majority of importations originate. Travellers have a greater probability of becoming infected during this time and indeed almost three times as many importations occurred during this period than during the six-month period June through November. Following the introduction of infection, further transmission in a European country also occurs more frequently if the introduction takes place during the period from December to May (Table 3). Importations during these months of increased incidence resulted in outbreaks which, on the average, were many times larger than outbreaks following importations during the period June to November.

Extensive studies in both endemic and non-endemic countries have clearly indicated the necessity for close, and often prolonged, personal contact before transmission of infection occurs. A single patient usually infects not more than a few persons, and only infrequently have cases been reported in which there was no direct or "face-to-face" contact with an earlier case. Under exceptional circumstances, however, a patient may infect many others and, on two occasions, virus aerosols are known to have been conveyed by convection currents to other rooms of the hospital where susceptibles were infected despite the absence of "face-to-face" contact.

In an outbreak in Meschede, Federal Republic of Germany (1970), 17 persons were infected by virus particles disseminated by air over a considerable distance within a single hospital building. A similar phenomenon was observed in the outbreak in Monschau, Federal Republic of Germany (1961) in which a second-generation case was the source of infection for 19 additional cases, only nine of whom had "face-to-face" contact with the patient. Several features believed to be of importance in this unusual pattern of transmission were common to both outbreaks. In both instances, the source case experienced an extensive rash and cough, thus presumably generating a heavy aerosol. Humidity was very low at the time thus permitting longer survival of the virus in air and air currents within the hospitals were conducive to

rapid dissemination. While airborne transmission of this sort is rarely observed in smallpox outbreaks, it is important to recognize that it may occur under certain circumstances.

In addition to these two instances when individual patients were responsible for infecting, respectively, 17 and 19 others, two additional outbreaks should be noted in which one patient infected a large number of persons. In the outbreak in Poland (1962), 25 persons became infected as a result of contact with a patient, a very popular young nurse suffering from haemorrhagic smallpox, incorrectly diagnosed as leukaemia. During her illness and even after her death, many - perhaps several hundred - staff members, patients and friends visited her room. In the outbreak in Yugoslavia (1972), a patient with severe confluent disease but whose diagnosis was not recognized, infected 38 others in the course of hospitalization and intensive care at four different hospitals. While instances such as these of widespread dissemination by a single patient do occur, it must be borne in mind that usually a given patient does not infect more than two to five other persons.

#### Discussion and conclusions

Importations of smallpox into Europe are occurring with diminishing frequency and may be expected even less often as further progress is made in the global eradication programme. Travellers returning from the heavily endemic countries during the period December through May are the ones who should be most closely scrutinized.

Smallpox outbreaks, although not detected until two or three generations of cases have occurred, have been reasonably rapidly and effectively contained when well-defined procedures of isolation, protective immunization and surveillance of close contacts of smallpox patients have been instituted. Since smallpox outbreaks usually develop comparatively slowly and many weeks normally elapse before a substantial number of persons becomes infected, it is not surprising that outbreaks may be effectively contained despite delays in clinical recognition of the disease. The comparatively slow spread of smallpox, observed both in endemic and non-endemic countries, is attributed to the fact that infection is almost invariably transmitted during "face-to-face" contact with a patient after the rash has begun to develop. Patients with classical smallpox, unmodified by vaccination, are usually confined to bed during this period and are therefore not normally in contact with many susceptible persons. While previously vaccinated persons may experience a very mild, highly modified form of smallpox and remain ambulatory, such persons excrete fewer organisms and are less efficient transmitters of infection.

For individuals with a rash and fever who are suspected to have smallpox, suitable facilities for isolation should be available in which the risk of further dissemination of the disease by aerosol is minimized. Proper isolation together with a regular programme of vaccination of hospital personnel should reduce the size of outbreaks.

An important measure in preventing importations, however, would be for each country to assure that all of its own travellers are properly immunized prior to departure from their native country. In many countries, glycerinated (liquid) vaccines with their inherently poor keeping properties are routinely employed in vaccination. Many vaccinations performed with such vaccines are unsuccessful. Consideration might be given to ensure, by some appropriate means, that travellers to the endemic countries have been properly vaccinated with a freeze-dried vaccine of assured potency.

The essential measure to prevent importations, however, is the global eradication of smallpox. The costs of such an effort are small indeed compared to the costs in each country associated with vaccination and quarantine.

TABLE 1. IMPORTATIONS OF SMALLPOX INTO EUROPE, JANUARY 1961-DECEMBER 1973

Import No.	Year	Month	Country	Total of cases	Subsequent infections acquired in hospitals or by medical personnel	Origin of imported infection	Method of transport of index case into Europe
1	1961	Jan.	Spain	17	13	India	Air
2	1961	March	Federal Republic of Germany	4	1	India	Air
3	1961	April	USSR	1	-	India	Air
4	1961	Oct.	Belgium	1	-	Zaire	Air
5	1961	Dec.	Federal Republic of Germany	5	2	Liberia	Air
6	1961	Dec.	Federal Republic of Germany	33	19	Pakistan	Air
7	1961	Dec.	United Kingdom	3	-	Pakistan	Air
8	1961	Dec.	United Kingdom	2	1	Pakistan	Air
9	1961	Dec.	United Kingdom	14	13	Pakistan	Air
10	1962	Jan.	United Kingdom	1	-	Pakistan	Air
11	1962	Jan.	United Kingdom	47	26	Pakistan	Air
12	1962	March	Poland	29	4	India	Sea
13	1962	July	United Kingdom	3	-	India	Sea
14	1963	March	Sweden	27	15	Asia (country unknown)	Air
15	1963	May	Poland	99	46	India	Air
16	1963	Aug.	Switzerland	1	-	Gabon	Air
17	1963	Unknown	Hungary	2	1	Unknown	Unknown
18	1965	Oct.	Federal Republic of Germany	1	-	United Rep. of Tanzania	Air
19	1966	Unknown	United Kingdom	72	1	Unknown	Unknown
20	1967	Feb.	Federal Republic of Germany	1	-	India	Air
21	1967	March	Czechoslovakia	1	-	India	Air
22	1967	March	Federal Republic of Germany	1	-	India	Air
23	1967	Oct.	United Kingdom	2	-	Pakistan	Air
24	1968	Feb.	United Kingdom	1	-	Pakistan	Air
25	1968	Aug.	Belgium	1	-	Zaire	Air
26	1970	Jan.	Federal Republic of Germany	20	19	Pakistan	Air
27	1970	Aug.	Denmark	1	-	Afghanistan	Air
			Norway	1	-	Denmark	
28	1972	Feb.	Yugoslavia	175	84	Iraq	Land
			Federal Rep. of Germany	1	-	Yugoslavia	
29	1973	Jan.	United Kingdom	1	-	India	Air
Total cases				568	245		

TABLE 2. EUROPE: INTRODUCTIONS OF SMALLPOX BY INCIDENCE RATE OF EXPORTING COUNTRY, 1961-1973\*

Year	Total No. Countries Reporting Smallpox	Annual Smallpox Incidence Rate in Exporting Country			
		< 3.0/100 000		≥ 3.0/100 000	
		Countries	Introductions	Countries	Introductions
1961	56	32	0	24	9
1962	61	32	0	29	4
1963	54	27	0	27	2
1964	46	24	0	22	0
1965	46	30	0	16	1
1966	43	25	0	18	0
1967	43	26	0	17	4
1968	38	22	0	16	2
1969	30	21	0	9	0
1970	23	14	0	9	2
1971	16	9	0	7	0
1972	19	11	1	8	0
1973	11	5	0	6	1
Total			1		25

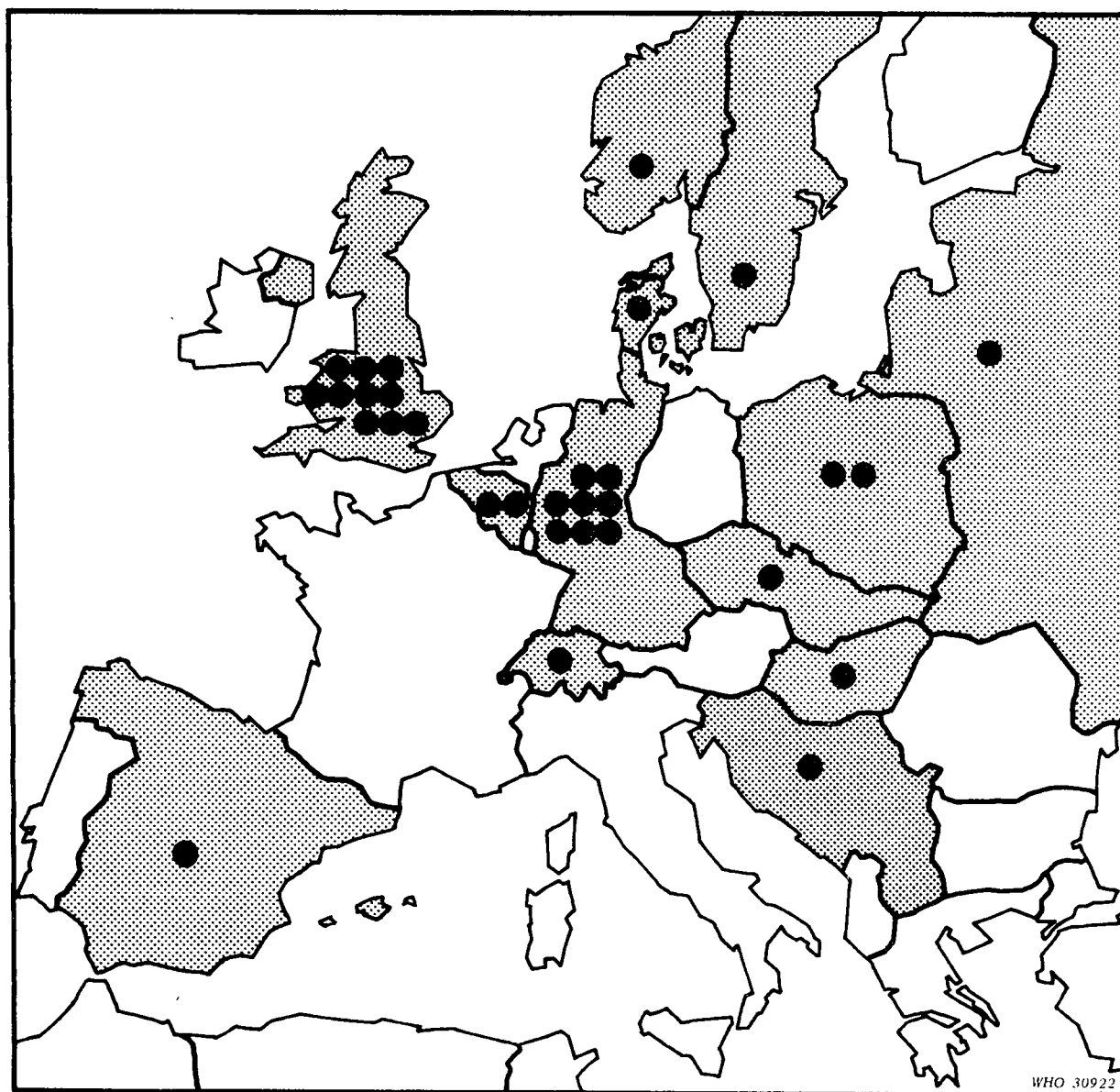
\* Excludes three introductions where country of origin could not be established



TABLE 3. SIZE OF OUTBREAK BY MONTH OF IMPORTATION OF SMALLPOX IN EUROPE  
1961-1973

Month of importation	No. of importations	No. of cases in each outbreak <sup>a</sup>				Total cases	Average (median) size of outbreak
		1	2-4	5-9	10+		
Dec.-May	20	7	3	1	9	483	24.2 (4.5)
June-Nov.	7	4	3	0	0	11	1.6 (1.0)
Total	27	11	6	1	9	494	18.3 (4.0)

<sup>a</sup> Two outbreaks not included. In one (2 cases), the dates are unknown; in the other (72 cases) no source case was found, although the first indigenous case was recognized in February.

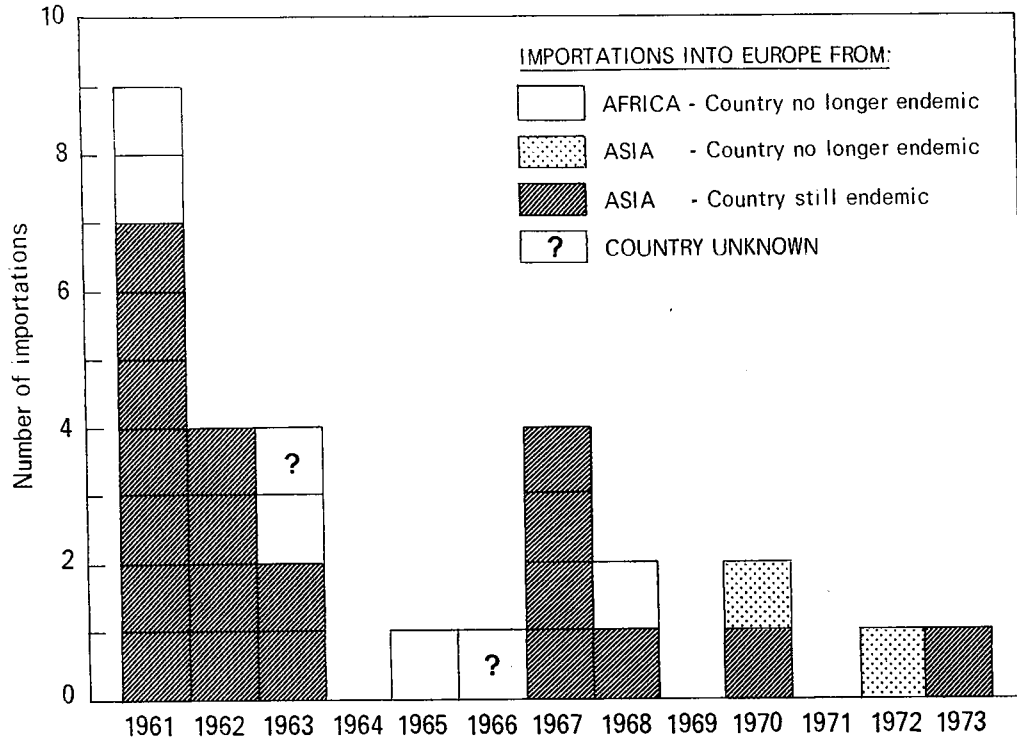
FIG. 1. EUROPE: IMPORTATIONS OF SMALLPOX, 1961-1973



-  Countries with smallpox importations
-  One importation

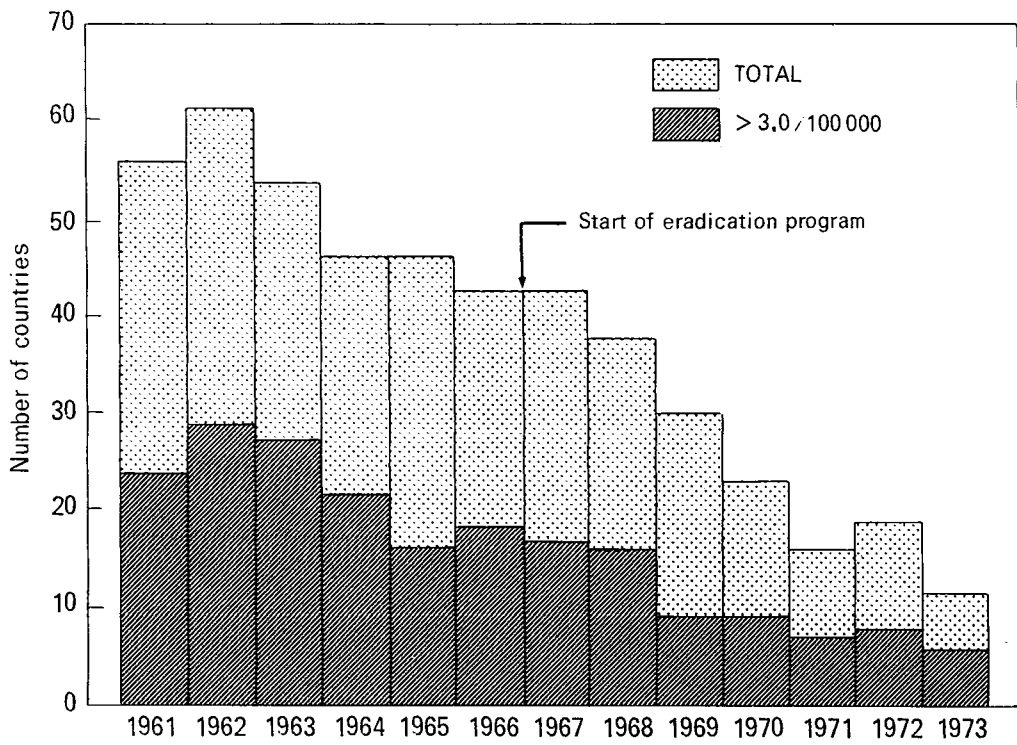
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FIG. 2. EUROPE: SMALLPOX IMPORTATIONS BY SOURCE OF INFECTION, 1961-1973



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FIG. 3. WORLD: NUMBER OF COUNTRIES REPORTING SMALLPOX CASES, 1961-1973



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