Smallpox Vaccination Campaign for Rhode Island Hospital Personnel

WILLIAM SCHAFFNER, M.D., and RITA M. ADAIR, R.N.

THE NATIONAL Communicable Disease Center of the Public Health Service informed the Rhode Island Department of Health in March 1967 of a smallpox epidemic in India which created an increased risk of international travelers' importing smallpox into the United States. Three times during the preceding month, smallpox acquired in India had been imported into Europe, and exposures to smallpox of returning U.S. travelers were reported shortly thereafter (*1*, *2*). The health department notified all Rhode Island physicians and hospitals of these events.

Previous outbreaks of smallpox had demonstrated that hospital personnel were generally not well protected and were at particularly high risk of acquiring the disease from someone with an imported case (*3*). Rhode Island is situated close to civilian jetports accommodating international air travel, has two military bases with worldwide connections, including an airport, and its major city, Providence, is an active seaport. Contact of hospital personnel with exposed travelers, therefore, was considered possible. During April, hospital administrators were informed that because of the international smallpox alert the department of health recommended the vaccination of hospital personnel and would furnish vaccine without charge for this purpose.

This report summarizes the results of the ensuing smallpox vaccination program and reinforces the view that such a program affords a simple, safe, and inexpensive service which should be provided routinely to all hospital workers.

Dr. Schaffner, who is currently the chief medical resident at the Vanderbilt University Hospital, Nashville, Tenn., at the time of the study was an epidemic intelligence service officer of the National Communicable Disease Center, Public Health Service, on assignment to the Rhode Island Department of Health, where he served as acting chief of the division of epidemiology. Mrs. Adair is a public health nurse-epidemiologist for the Rhode Island Department of Health.

Background and Methods

The Rhode Island population of approximately 900,000 persons is served by 13 voluntary general hospitals, a Veterans' Administration hospital, and several specialty hospitals. The State director of health urged the general hospitals and the Veterans' Administration hospital to participate in this program. Also, members of the staff of a local children's home were included, on their request.

The health department provided lyophilized smallpox vaccine in 10- and 100-dose vials, as well as consultation on management of the vaccination effort. Personnel of the department, however, did not participate directly in individual hospital campaigns. Methods and recommendations for such vaccination programs are detailed in a pamphlet prepared by the National

Communicable Disease Center and the American Hospital Association (*4*).

The contraindications to, and the various complications from, vaccination were emphasized. Tabulated results and reports of complications were collected from each hospital upon completion of its program. All complications were confirmed by health department investigation.

Results

Twelve of the 13 general hospitals, the Veterans' Administration hospital, and the children's home participated in the vaccination campaign. The administrator of the sole nonparticipating hospital offered no explanation for his decision. Each institution planned and executed its own program. Some hospitals responded almost immediately and vaccinated their personnel within a week while others began later and vaccinated small groups over a period of a month or longer. One hospital waited 6 months to start its program. A few programs were very rigorous, encompassing virtually all employees and attending physicians; others were more lax. The success of the individual programs could be correlated directly with the degree of enthusiasm and the public health awareness of the person in the hospital responsible for the program.

The 14 hospitals to which the program was offered employed approximately 9,444 persons. Of these, 8,823 (93 percent) were employees of the 13 participating hospitals. The children's home employed 60 persons. The results of the vaccination program are summarized in the table.

Among institutions able to provide the data, the percentage of employees who had been vaccinated in the previous 3 years ranged from zero to 50 percent, with an average of 25 percent. The majority of these employees were recently graduated nurses who had been vaccinated during their training.

A total of 3,473 vaccinations were performed during the program, accounting for 38 percent of the employees of the participating institutions. The percent vaccinated within each institution ranged from 18 to 100 percent. When the number of persons with a history of vaccination within the preceding 3 years was added to this total, the percent of recently vaccinated employees was raised to 55 percent. Institutions which were able to provide data on previous vaccinations of employees had rates of vaccination within 3 years of 41 to 100 percent; four achieved levels of more than 80 percent. Some hospitals excluded numerous employees from the vaccination program because of medical contraindications. The specific grounds for these decisions were not recorded.

Although exuberant primary reactions were noted frequently, only one employee stayed home from work for this reason. There was no reported transmission of vaccinia virus to hospitalized patients. Complications were uncommon. Six urticarial rashes occurred. One erythema multiforme-like eruption and one secondary bacterial infection of a vaccination site resulted in a total of 3 days' absence from work. In addition, one employee developed benign generalized vaccinia, which did not interfere with her usual activities. The total complication rate was 2.6 per 1,000 vaccinations performed.

The cost of the vaccine to the health department was approximately $850, an average of $70 per hospital.

Discussion

There has been ample demonstration that the hospital acts as the principal epidemiologic focus in the spread of smallpox after the disease has been imported into smallpox-free areas of the Western World (*3*).

Since 1945, there have been 81 such introductions, and 30 of the subsequent outbreaks were investigated carefully. Of the 516 patients whose mode of acquisition was established, 280 (54 percent) probably acquired the disease from hospital exposures (*5*). Typically, such hospital exposures result from misdiagnosis of the index case, usually for one of the following reasons: (*a*) smallpox may not be suspected because the attending physician is unfamiliar with the disease; (*b*) the illness may be considerably modified by prior immunization—exemplified by a dermatologist not recognizing his own modified infection (*1*); or (*c*) fulminant hemorrhagic smallpox with atypical skin lesions may be present. Occassionally a correct diagnosis may not be made until secondary or tertiary

Smallpox vaccination program for hospital employees, Rhode Island, 1967

Institution	Number of employees	Vaccinated within 3 years		Number with medical contraindication	Number who refused	Employees vaccinated during program		Total employees vaccinated within 3 years	
		Number	Percent			Number	Percent	Number	Percent
Hospital									
1	923	34	4	92	50	719	77	753	82
2	240	---	---	---	---	141	59	---	---
3	700	350	50	1	224	125	18	475	68
4	658	350	53	2	"Many elderly employees"	188	29	538	82
5	550	20	4	2	1	417	76	437	80
6	2,800	600	21	---	---	687	24	1,287	46
7	140	---	---	---	---	104	74	---	---
8	227	---	---	5	163	58	25	---	---
9	280	---	---	---	"Some"	86	31	---	---
10	460	---	---	58	203	167	36	---	---
11	248	---	---	---	---	118	48	---	---
12	702	---	---	0	---	300	77	---	---
13	900	70	8	12	450	303	33	373	41
Children's home	60	0	0	0	0	60	100	60	100

(---)—Data not available.

cases have occurred, usually among hospital employees or patients. Hospital-acquired infections almost invariably occur among persons who are unvaccinated or who last were vaccinated many years previously; those with relatively recent vaccinations are generally spared. The 1962 British outbreak serves as an example; only one of 40 hospital-acquired infections occurred among those who had been vaccinated within the 15 years preceding the outbreak (*6*).

A number of hospitals in the United States recently have conducted surveys of the immunity status of their employees (*5*, *7–10*). These surveys indicate that, although most persons have been vaccinated at some time during their lives, the current levels of employee protection are rather low, ranging from only 4 to 41 percent. The Rhode Island data are in agreement; an average of only 25 percent of the State's hospital employees had been vaccinated within the 3 years preceding the vaccination campaign. While relatively few hospitals have conducted surveys, those doing so have been located in several geographic regions and have included small and large community hospitals, university centers, and Veterans' Administration hospitals. It is reasonable to suspect that similar inadequate levels of protection can be found in most hospitals in this country.

The National Communicable Disease Center and the American Hospital Association cooperated in a seven-hospital study which demonstrated the feasibility, safety, and economy of employee vaccination projects of various types (*5*, *8*, *9*). Subsequently, the Omaha-Douglas County (Nebraska) Health Department reported a successful campaign to immunize employees of 13 hospitals against a variety of diseases (*10*). The results of the Rhode Island program are consistent with those reported previously and add to the fund of experience which supports the adoption of such programs as a routine practice. Even the leading exponent of discontinuing the practice of universal vaccination advocates the regular revaccination of high-risk groups, including hospital personnel (*11*). Moreover, this common view is embodied in the formal recommendations of the Public Health Service Advisory Committee on Immunization Practices (*12*).

Three factors, we believe, contributed to the acceptance of the vaccination activities by the Rhode Island hospitals: (*a*) the acute international smallpox situation and the epidemiology of imported smallpox were explained clearly to the hospital administrators, (*b*) the department of health made an unequivocal recommendation that these vaccination programs be

carried out, and (*c*) smallpox vaccine was offered without cost to the hospitals. Individual hospitals achieved variable success, immunizing from 18 to 77 percent of employees. The level of protection of those vaccinated within 3 years was raised to at least 80 percent in three hospitals and the children's home.

The administrator of one hospital declined to participate, and the staff of another required 6 months to decide to do so. The reasons for this reluctance are not clear, but the point of view expressed by a representative of the dilatory institution may be illuminating. This 200-bed hospital had contracted with a practicing physician to supervise its employee health program. Since the time available for employee health was circumscribed, he was reluctant to commit the hospital to new programs. There was also local opinion that employee health programs should be limited in scope and that most medical situations, including routine vaccination, should be referred to the employee's private physician. This opinion was based on the tenuous assumption that everyone has a private physician. Furthermore, despite the hospital's location of less than 1 hour's drive from a major airport, the staff considered it unlikely that an international traveler would ever seek admittance.

Even with the stimulus of an international smallpox alert, Rhode Island's "crash" vaccination program for hospital employees achieved only modest immediate success. A hospital can be considered reasonably well protected if 80 percent of its employees have been vaccinated within the proceding 3 years. Three of the 13 hospitals achieved this goal. The emergency program did not, of itself, result in a long-term solution, but it produced a more subtle benefit. It provided the impetus for action both by the health department and the hospitals in the broad area of employee health practices. One hospital now requires new employees to provide evidence of having had a smallpox vaccination within 3 years, four hospitals vaccinate new employees on a voluntary basis, and one hospital has inaugurated an annual voluntary vaccination program for all employees. Clearly, before many hospitals will adopt comprehensive employee health programs, including periodic smallpox vaccination, a major public health educational effort must be directed at physicians and hospital administrators. The inclusion of mandatory pre-employment and periodic employee smallpox vaccination in the requirements for hospital licensure is presently under study in Rhode Island.

Conclusions

In the face of an international smallpox alert, it was possible to rapidly implement an emergency vaccination program for hospital employees in Rhode Island. Upon completion of the program, one-half the employees could be considered protected (by vaccination within the preceding 3 years)—a modest success. The experience confirmed that such a program is safe, easy to administer, and inexpensive. The program has also led to attempts to solve the more basic problem of immunization of hospital employees on a permanent basis. The Rhode Island hospital licensing board has found the issue so important and the voluntary response of the hospitals so desultory that it is considering incorporating employee immunization requirements into hospital licensing regulations. Unless State health departments, hospital licensing boards, and the American Hospital Association adopt stricter requirements concerning employee health it is unlikely that there will be rapid progress in affording hospital employees—and, in some cases, the hospital patients—protection from preventable communicable diseases.

Summary

A smallpox vaccination program for hospital employees was carried out in 13 hospitals and one children's home in Rhode Island subsequent to the announcement of an international smallpox alert during the spring of 1967. Only 25 percent of the hospital employees surveyed were found to have been vaccinated during the previous 3 years. A total of 3,473 additional employees were vaccinated during the program, increasing the percentage of personnel known to have been vaccinated within the preceding 3 years to 55 percent. No vaccinia was transmitted to patients and no major complications occurred, but three employees lost a total of 6 working days because of minor vaccine-related illnesses.

The hospital licensing board of Rhode Island is now considering incorporating employee immunization requirements into licensing regula-

tions. Clearly, high-risk groups, including hospital employees and staff, should be revaccinated routinely according to a regular schedule.

REFERENCES

(1) National Communicable Disense Center: Smallpox imported into Germany from India. Morbidity and Mortality Weekly Report, vol. 16, No. 12, Mar. 25, 1967, pp. 93–94.

(2) National Communicable Disense Center: Suspected smallpox—Honolulu, Hawaii. Morbidity and Mortality Weekly Report, vol. 16, No. 13, Apr. 1, 1967, pp. 101–102.

(3) Millar, J. D.: Smallpox: A continuing threat. Hospitals 30: 57–59 (1965).

(4) American Hospital Association: National program for the vaccination of hospital workers against smallpox. Chicago, 1966.

(5) National Communicable Disease Center: Smallpox vaccination of hospital personnel—USA. SEP [Smallpox Eradication Program] Report, vol. 1, No. 3, November 1967, pp. 20–22.

(6) Millar, J. D.: Hospital acquired virus diseases. *In* Proceedings of the National Conference on Institutionally Acquired Infections. PHS Publication No. 1188, U.S. Government Printing Office, Washington, D.C., 1964, pp. 106–112.

(7) Lyman, E. D., Kirby, C. D., and Eelkema, R. C.: Immunization status of select high-risk adult population groups. Nebraska Med J 50: 160–163 (1965).

(8) Smith, J. W., Seidl, L. G., and Johnson, J. E.: Smallpox vaccination in hospital personnel. JAMA 197: 309–314 (1966).

(9) Sidel, V., and Bonanno, R. A.: "At risk" hospital personnel singled out by smallpox and tetanus survey. Hospitals 40: 54–58 (1966).

(10) Sells, C. J., Lyman, E. D., and Kirby, C. D.: A community hospital immunization program. Public Health Rep 84: 271–274, March 1967.

(11) Kempe, C. H.: To vaccinate or not? Hosp Prac 3: 28–33, September 1968.

(12) National Communicable Disease Center: Recommendation of the Public Health Service Advisory Committee on Immunization Practices: Smallpox vaccine. Morbidity and Mortality Weekly Report, vol. 15, No. 47, Nov. 26, 1966, pp. 404–407.

Survey of Beryllium Production and Use

The Environmental Control Administration (ECA) of the Department of Health, Education, and Welfare is conducting a comprehensive study in major American industrial plants producing and using beryllium.

A principal objective of the study is to determine safe levels of exposure to beryllium and its compounds and to recommend measures to control these exposures. Surveys already initiated in Ohio and Pennsylvania include collection of medical data on beryllium workers, detailed studies of the environment in which they work, and a review of mortality records for such workers.

Beryllium is used as an alloying agent in copper, in making rocket interstage spacers and aircraft brakes, and in the construction of nuclear reactors. Beryllium oxide stores and conducts heat efficiently. Beryllium disease occurs in a number of forms, such as dermatitis, conjunctivitis, acute pneumonitis, and chronic pulmonary berylliosis. Both acute pneumonitis and chronic pulmonary berylliosis can be fatal.

The first phase of the study is a survey of the two major producers of beryllium in this country: the Brush Beryllium Company, with plants in Cleveland and Elmore, Ohio, and the Beryllium Corporation, with plants in Reading and Hazelton, Pa. Health consultants and departments of health in both States will also cooperate in these surveys.

A medical team from the Occupational Health Program of ECA has compiled medical and occupational histories of the workers at the study sites, performed pulmonary function tests, and given chest X-ray examinations. The ECA Occupational Health Field Station in Morgantown, W. Va., is planning a study of persons with known cases of chronic pulmonary berylliosis to develop new diagnostic procedures to supplement those presently available.

Program Notes

Infant Mortality Down

The infant mortality rate in Maryland for 1967 showed a 4 percent decrease. The number of deaths of infants under 1 year of age per 1,000 live births was 22.2 in 1967, compared with 23.3 in 1966. The decline marked the fifth successive annual decrease.

The birth rate in Maryland in 1967 was the lowest for the State since 1940—18.9 per 1,000 residents.

Store-Front Health Clinic

A store-front maternal and child health clinic with a built-in basic kitchen for its nutrition program has been opened in a shopping center at Roxbury, Mass. Federally financed and city operated, the health center is administered by the Boston Maternity and Infant Care Project under Dr. Hope Snider.

The project will provide individual continuing care for up to 150 low-income outpatients a day. A staff of physicians from the obstetrics and pediatric department at Boston City Hospital as well as nurses, social workers, nutritionists, clerks, and child care workers provides a full range of diagnostic, treatment, preventive, and counseling services for children and pregnant mothers. The nutrition program includes guidance on marketing, food preparation, and introduction to new foods that can contribute to a better diet.

Policy Statement on Marihuana

In a recent policy statement on marihuana issued by the Massachusetts Medical Society and endorsed by the State's Drug Addiction Rehabilitation Board, the following paragraph appears:

"Legal sanctions should differentiate between those who manufacture or distribute the drug and those who use it. The former should be dealt with strictly, invoking full penalties for a criminal act. The latter should be judged as to whether they are occasional users or frequent users. Youthful experimenters should be treated leniently and their careers not jeopardized by a criminal record. Chronic users should be treated medically and psychiatrically as in the case of persons dependent on other drugs, such as narcotics or alcohol, and social rehabilitative services should be made available to them."

Cleaning Up the Waters

The New York State Legislature has empowered the State's Pure Water Authority to carry out whatever phases of work are needed to help communities obtain sewage treatment facilities. Since the authority became operational in the fall of 1967, it has established contacts with more than 260 municipalities.

As of January 22, 1969, the authority had signed seven contracts with municipalities. Four of these contracts were for financing, design, construction, operation, and maintenance of sewage treatment projects; another was for financing, design, and construction; and two others were for short term financing for construction of treatment facilities. It also was drafting six additional contracts for authority service to local governments as of the same date.

Eight Hudson River communities in three counties are jointly considering the feasibility of curbing their pollution of the Hudson through a regional program and have contracted with the authority to provide services to help tool up the project.

Earn-Learn for Nurses

An earn-learn program is helping to attract new nurses and to retrain the current staff at Temple University Hospital, Philadelphia, Pa. It allows a registered nurse to take time off from work at full pay to seek a baccalaureate or graduate degree.

A nurse who meets certain qualifications may receive 40 hours' pay for 30 hours' work if she is seeking a degree in nursing or education. The program also provides free tuition for a minimum of 6 credit hours and a maximum of 7½ hours of formal courses each semester.

The program was developed by Casmira Marciniszyn, assistant hospital administrator in charge of patient care and nursing, and Richard L. Durbin, hospital administrator. Miss Marciniszyn reports that the program and changes in nursing procedure have attracted many nurses to the hospital. In September 1967, the staff included 283 registered nurses; in October 1968 the staff included 386.

Disaster Inventory Units

A Hospital Reserve Disaster Inventory unit was used in Mississippi for the first time in a disaster on January 23, 1969, when a tornado struck. The unit in the Hardy Wilson Memorial Hospital at Hazelhurst proved of immeasurable help in aiding the victims, reported Donald R. Sorrels, administrator of this 59-bed facility. It was especially helpful, he said, in followup treatment, particularly in preventing tetanus.

A Hospital Reserve Disaster Inventory unit represents a reserve supply of essential medical items necessary for medical care, including pharmaceuticals and surgical dressings and supplies. Such units have been installed in nearly 2,000 selected hospitals throughout the country under a program of the Division of Emergency Health Services, Health Services and Mental Health Administration, Public Health Service. Seventeen HRDI units have been placed in hospitals in Mississippi.

Items for this page: Health departments, health agencies, and others are invited to share their program successes with others by contributing items for brief mention on this page. Flag them for "Program Notes" and address as indicated in masthead.