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U.S. Beryllium Case Registry through 1977[1]

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Chronic beryllium disease is the pulmonary and systemic granulomatous disease caused by exposure to beryllium. The Beryllium Case Registry was established in 1952 to collect data on the epidemiology, diagnosis, clinical features, course, and complications of beryllium-related diseases. New cases continue to be reported to the Registry at the rate of approximately one per month. Since 1969, when the Registry was moved to the Pulmonary Unit of the Massachusetts General Hospital, 96 cases of beryllium disease have been added to the Registry. This communication will serve as a report of the cases admitted to the Beryllium Case Registry in the 5-year period between 1973 and 1977. In 1973, a report from the Registry (Hasan and Kazemi, 1973) stated that a total of 832 cases of beryllium disease had been entered into the Registry. In the 5 years since that report, 55 additional cases of beryllium disease have been added to the Registry files, for a total of 887 cases as of December 31, 1977. Of these 887 cases, 631 have been classified as chronic, 212 as acute, and 44 as acute cases in which chronic beryllium disease developed subsequently. Table 1 presents data on the status of these cases. Forty-six percent of the cases are known dead, 40% are known to be alive, and in 14% the status is unknown.

Of the 55 cases admitted between 1973 and 1977, 40 were men and 15 were women. The United States distribution by the state in which exposure occurred in these cases is listed in Table 2. Many of the early reported cases of beryllium disease had initial exposure to beryllium in World War II productions and fluorescent light manufacturing. Although by 1950 beryllium was discontinued from further use in fluorescent light manufacturing and general improvements in control of beryllium in other industries were instituted, cases whose initial exposures occurred after 1950 continue to be reported to the Registry. The years of initial exposure to beryllium of the cases admitted to the Registry from 1973 to 1977 are listed in Table 3. Forty-four percent had their initial exposure after 1950, with 3 cases exposed for the first time as late as 1971. Many of the modern exposures to beryllium occurred in electronics and nuclear industries in the production and use of beryllium-containing alloys and beryllium oxide ceramics. The sources of industrial or environmental exposures in the cases reported since 1973 are listed in Table 4. In the 4 cases for whom the source of exposure is not listed, the previously published criteria for the diagnosis of beryllium disease (Hasan and Kazemi, 1974) were met. In all 4 cases, lung tissue examined histopathologically showed

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TABLE 1
STATUS OF 887 CASES OF BERYLLIUM DISEASE

	Number	Percentage
Known dead	408	46
Known alive	356	40
Unknown	123	14
Total	887	100

noncaseating granulomata and beryllium levels by fluorometric analysis exceeded 0.02 μg/g, a level which has only been found in individuals exposed to beryllium, and not in normals or patients with sarcoidosis (Sprince *et al.*, 1976).

It is very likely that the total number of cases in the Registry represents an underestimate of the true prevalence of chronic beryllium disease. Cases continue to be reported in which the diagnosis was sarcoidosis until the history of beryllium exposure led to the finding of beryllium in lung tissue or mediastinal lymph node biopsy. A survey of 214 beryllium extraction workers (Kanarek *et al.*, 1973) identified 4 individuals with chronic beryllium disease and 11 whose findings of hypoxemia and interstitial infiltrates probably represented early beryllium disease. Another recent survey of workers in a beryllium copper production plant (Chrostek *et al.*, 1976) revealed that of 9 cases of beryllium-related diseases known to the company physician, only 2 had been reported to the Registry.

In the last 5 years, the Registry has admitted only one case of acute beryllium disease, which by the definition of Hamilton and Hardy (1974), includes beryllium-induced pulmonary disease with less than 1 year's duration. After 2 years of work at a beryllium extraction plant, this employee developed acute beryllium disease in 1960. Follow-up 12 years after the acute disease reportedly

TABLE 2
EXPOSURE BY STATE OF PATIENTS REPORTED TO THE REGISTRY FROM 1973 TO 1977

State	Cases (number)
Massachusetts	20
Pennsylvania	10
Connecticut	7
California	4
New Jersey	3
Colorado	2
Ohio	2
Rhode Island	2
Alabama	1
Florida	1
Iowa	1
New York	1
North Carolina	1
Total	55

TABLE 3
YEAR OF INITIAL EXPOSURE TO BERYLLIUM OF PATIENTS REPORTED TO THE REGISTRY FROM 1973 TO 1977[a]

Initial exposure period	Number of cases
1940–1949	28
1950–1959	6
1960–1969	13
1970–1977	3

[a] In one neighborhood case and four other cases, the year of initial exposure is not known.

revealed no evidence for the development of chronic beryllium disease in his case. Peak air concentrations for beryllium measured in the plant where that worker was employed were as high as 50 times the accepted peak limit value of 25 $\mu g/m^3$ at any one time during an 8-hr day (Kanarek *et al.*, 1973).

Tissue analysis for beryllium continues to be a useful tool for confirming the diagnosis of chronic beryllium disease. Beryllium has been detected in lung, mediastinal, and other lymph nodes, liver, skin, and other tissues. Beryllium analyses for the Registry are performed at the Environmental Medical Services Laboratory at Massachusetts Institute for Technology using a modified Morin fluorometric method (Walkley, 1959). A recent study (Sprince *et al.*, 1976) has shown that analysis of lung tissue for beryllium documents exposure to beryllium and helps in the frequently difficult differentiation between sarcoidosis and chronic beryllium disease.

Data from the Registry support the fact that chronic beryllium disease is a continued occupational hazard. In addition, the United States Public Health Service in 1970 estimated that 30,000 workers are exposed to beryllium. In view of the cases reported to the Registry in whom initial exposure to beryllium occurred after 1950 and the continued use of beryllium, especially in electronics and nuclear

TABLE 4
SOURCE OF EXPOSURE OF PATIENTS REPORTED TO THE REGISTRY FROM 1973 TO 1977

Source of exposure	Cases (number)	%
Extraction and smelting of beryllium	7	12.7
Beryllium metal productions	25	45.5
Alloys	15	
Ceramics	3	
X-ray tubes	2	
Research	4	
Vacuum tubes	1	
Fluorescent tube production	17	31.0
Neon tube production	1	1.8
Neighborhood cases	1	1.8
Unknown source	4	7.2
Total	55	100

productions, beryllium disease should be considered in the current differential diagnosis of granulomatous and interstitial lung disease.

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